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Original Article

Correlation between Altmetric Attention Score and Citation in the Urological Cancers Literature

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HIGHLIGHTS

- Altmetric can measure the impact of literature with higher velocity than traditional citation scores.
- The present study examined the online attention toward urology cancer field articles with the highest citation number utilizing Altmetric data.
- There is an association between citation and Altmetric attention score.

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ABSTRACT

Introduction
The association between the Altmetric Attention Score (AAS), a surrogate of public attention, and citation in urology cancer field articles was evaluated.

Methods
We searched in Scopus based on the existence of the following terms in the title, abstract, and keywords: prostate or bladder or kidney or renal or testis, AND tumor or cancer or malignancy, and the top 50 articles of 2015 with the highest citation counts were enrolled in our study. AAS was calculated using Altmetric explorer, and the citation number was extracted from Scopus.

Results
At last, 23 irrelevant articles were excluded, and 27 remained. The article with the highest citation was placed 11th in the AAS ranking, and the article with the highest AAS was the 12th highly cited article. AAS had a significant association with citation count; however, it did not associate with journals' impact factor, study type, study topic, articles access, type of tumor, and geographic distribution (P-value>0.05). Most articles were original, mainly with "molecular mechanism and genetics" topics, and originated from USA institutions. Moreover, many were published in open-access journals and dedicated to prostate cancer.

Conclusions
Articles with fabulous citation counts do not necessarily have a higher Altmetric score, which indicates that subjects with high popularity among people may not interest the scientific community.

Keywords: Prostate; Bladder; Kidney; Testis; Cancer; Altmetric

Introduction

With tremendous advancements in life expectancy, the incidence of cancer-related deaths along with cancer treatments attempts has risen notably (1, 2). Urological cancers, mainly prostate, bladder, kidney, and testis cancers are prevalent worldwide; however, their incidence and mortality vary among different countries (3, 4). Among men, apart from skin cancers, prostate cancer is the most prevalent cancer, with an annual incidence of 240,000 new cases in the United States (2). Likely, bladder cancer imposes a significant burden on the healthcare system; as shown in 2012, 14,880 deaths were attributed to bladder cancer in the United States (2, 5). Up to now, quite an amount of efforts have been made to address risk factors

of urological cancers, and several of them, including, but not limited to, metabolic, behavioral, and environmental risk factors, have been identified (2).

Although traditionally, the impact of the journal that published the article and number of citations were the main tools in order to measure the quality of the article, currently, due to progress and gaining popularity in new technology, new metrics have been introduced as means of evaluating the usage and the spread of scientific papers (6). Nowadays, with substantial improvements in new technologies such as wearable devices (7), big data (8), and cloud computing (9), desirable situations are provided for people to be aware, share, and analysis different aspects of cancer diseases. Moreover, medical staff can derive enormous benefits from evolving comprehensive information regarding, for instance, cancer pathogenesis and genetic features of cancer diseases (10).

Altmetric, a supplement of bibliometric, traces the existence of a scientific paper on social platforms by calculating the mentions that a paper obtained through different media, including Twitter, Facebook, Blogs, policy sources, news outlets, Wikipedia, Reddit, online videos, patents, and Google (11, 12). The Altmetric score calculates within an automated algorithm and indicates a weighted sum of attention for a specific research output (11). To the best of our knowledge, there is no available study regarding the compassion between Altmertic score and citations in the urology cancer field. We found out that there is a knowledge gap concerning public attention to urological cancer articles. Hence, herein, we designed a study to evaluate whether there is an association between citation and Altmetric attention score (AAS) in the top 50 highly cited articles in cancer urology cancer field published in 2015.

Methods

We aimed to define top-ranked articles in urology about the four most prevalent tumors, including prostate, bladder, renal/kidney, and testis. We assumed that each paper's five-year period was required to evaluate its penetration indexes into academic and public communities. Therefore, articles published in Scopus between January 2015 and December 2015 were included. Our search strategy was based on the following terms in the title or abstract: prostate, bladder, or kidney or renal or testis AND tumor or cancer or malignancy.

The search results were sorted according to citation count, and a full list of 50 top-ranked articles was obtained from Scopus. Then, the list was purified based on relevancy to the field of urology by two authors (M. AP and SS. T) independently. The study titles, abstracts, and full texts were checked and 23 irrelevant articles were excluded. Data extraction was performed by two authors (M. AP and SS. T), and the first author, journal's name, article type, country, major topic, tumor type, AAS of paper, and citation in August 2020 were extracted. The two researchers identified article type (original, reviews, and note), major topic (epidemiology, treatment, molecular mechanism and genetics, diagnosis and early detection, etiology and risk factors), tumor type (prostate, bladder, kidney, testis), and article access (non-open access vs. open access). The AAS was obtained from the Altmetric Bookmarklet tool downloaded from the website Altmetric.com. Information related to online attention to the publications (e.g., Twitter, Facebook, Mendeley, Etc.) was reported from this tool. The journals' impact factors (IF) and quartiles (Q) were collected from SJR (http://scimagojr.com). In addition, citation numbers were extracted from Scopus (HTTP://www.Scopus.com).

Statistical analysis

We used the median and the ranges of values (minimum-maximum) to describe data. Study data that were not normally distributed and comparisons were made using

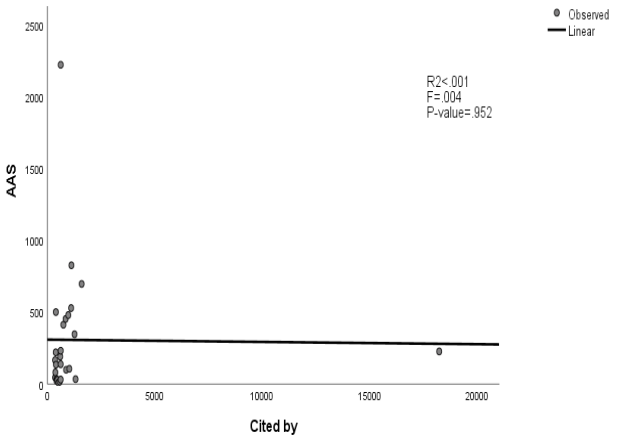

Figure 1a. Relationship between citations and AAS for all papers

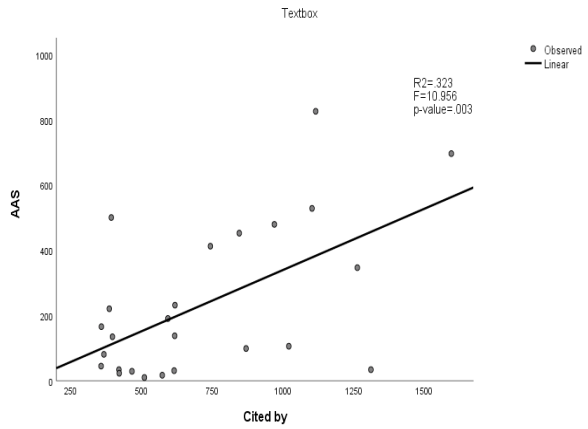

Figure 1b. Relationship between citations and AAS for 26 papers (excluding the 2 outliers: 1 & 12)

Table 1. list of 27 most cited articles in Scopus, 2015 in relation to four urological cancers including prostate, kidney, bladder, and testis

Title	First Author	Journal	Article Type	Open Access	Country	Subject	Tumor Type	Citation Number
Global cancer statistics, 2012	Torre L.A.	CA Cancer Journal for Clinicians	Original article	No	USA	Epidemiology	Prostate, bladder, kidney, testis	18248
The Global Burden of Cancer 2013	Fitzmaurice C.	JAMA Oncology	Original article	Yes	USA	Epidemiology	Prostate, bladder, kidney, testis	1595
EAU guidelines on renal cell carcinoma: 2014 update	Ljungberg B.	European Urology	Original article	No	Netherland	Treatment	Kidney	1311
Integrative clinical genomics of advanced prostate cancer	Robinson D.	Cell	Original article	Yes	USA	Molecular mechanism and genetics	Prostate	1263
Global surveillance of cancer survival 1995-2009: Analysis of individual data for 25 676 887 patients from 279 population-based registries in 67 countries (CONCORD-2)	Allemani C.	The Lancet	Original article	No	UK	Epidemiology	Prostate	1116
Chemohormonal therapy in metastatic hormone-sensitive prostate cancer	Sweeney C.J.	New England Journal of Medicine	Original article	Yes	USA	Treatment	Prostate	1103
The Molecular Taxonomy of Primary Prostate Cancer	Abeshouse A.	Cell	Original article	No	USA	Epidemiology	Prostate	1021
DNA-repair defects and olaparib in metastatic prostate cancer	Mateo J.	New England Journal of Medicine	Original article	Yes	UK	Treatment	Prostate	970
Olaparib monotherapy in patients with advanced cancer and a germline BRCA1/2 mutation	Kaufman B.	Journal of Clinical Oncology	Original article	No	USA	Treatment	Prostate, bladder	870
Comparison of MR/ultrasound fusion-guided biopsy with ultrasound-guided biopsy for the diagnosis of prostate cancer	Siddiqui M.M.	JAMA - Journal of the American Medical Association	Original article	Yes	USA	Diagnosis and early detection	Prostate	846
PD-L1 expression as a predictive biomarker in cancer immunotherapy	Patel S.P.	Molecular Cancer Therapeutics	Review	Yes	USA	Molecular mechanism and genetics	Prostate, bladder, kidney	744

Carcinogenicity of consumption of red and processed meat	Bouvard V.	The Lancet Oncology	Note	No	France	Etiology and risk factor	Prostate	619
The evolutionary history of lethal metastatic prostate cancer	Gundem G.	Nature	Original article	No	Finland	Molecular mechanism and genetics	Prostate	619
Abiraterone acetate plus prednisone versus placebo plus prednisone in chemo-therapy-naive men with metastatic castration-resistant prostate cancer (COU-AA-302): Final overall survival analysis of a randomised, double-blind, placebo-controlled phase 3 study	Ryan C.J.	The Lancet Oncology	Original article	No	USA	Treatment	Prostate	618
Evaluation of hybrid 68Ga-PSMA ligand PET/CT in 248 patients with biochemical recurrence after radical prostatectomy	Eiber M.	Journal of Nuclear Medicine	Original article	Yes	Germany	Diagnosis and early detection	Prostate	616
Long-term follow-up of a large active surveillance cohort of patients with prostate cancer	KLOTZ L.	Journal of Clinical Oncology	Original article	No	Canada	Epidemiology	Prostate	594
The diagnostic value of PET/CT imaging with the 68Ga-labelled PSMA ligand HBED-CC in the diagnosis of recurrent prostate cancer	Af-shar-Oro-mieh A.	European Journal of Nuclear Medicine and Molecu-lar Imaging	Original article	Yes	Germany	Diagnosis and early detection	Prostate	574
Annual report on status of cancer in China, 2011	Chen W.	Chinese Journal of Cancer Research	Original article	No	China	Epidemiology	Prostate, bladder, kidney, testis	511
Molecular biology of bladder cancer: New insights into pathogenesis and clinical diversity	Knowles M.A.	Nature Reviews Cancer	Review	No	UK	Molecular mechanism and genetics	Bladder	467
Emerging mechanisms of resistance to androgen receptor inhibitors in prostate cancer	Watson P.A.	Nature Reviews Cancer	Review	No	USA	Molecular mechanism and genetics	Prostate	422

Can Clinically Significant Prostate Cancer Be Detected with Multiparametric Magnetic Resonance Imaging? A Systematic Review of the Literature	Fütterer J.J.	European Urology	Review	No	France	Diagnosis and early detection	Prostate	421
Free Radicals: Properties, Sources, Targets, and Their Implication in Various Diseases	Phaniendra A.	Indian Journal of Clinical Biochemistry	Review	No	India	Molecular mechanism and genetics	Prostate, bladder	398
Cancer statistics in Korea: Incidence, mortality, survival, and prevalence in 2012	Jung K.-W.	Cancer Research and Treatment	Original article	Yes	Korea	Epidemiology	Prostate, bladder, kidney, testis	394
Lenvatinib, everolimus, and the combination in patients with metastatic renal cell carcinoma: A randomised, phase 2, open-label, multicentre trial	Motzer R.J.	The Lancet Oncology	Original article	No	UK	Treatment	Kidney	387
Androgen receptor splice variant 7 and efficacy of taxane chemotherapy in patients with metastatic castration-resistant prostate cancer	Antonarakis E.S.	JAMA Oncology	Original article	Yes	USA	Molecular mechanism and genetics	Prostate	368
Trends in management for patients with localized prostate cancer, 1990-2013	Cooperberg M.R.	JAMA - Journal of the American Medical Association	Original article	Yes	USA	Treatment	Prostate	359
MTOR regulates the pro-tumorigenic senescence-associated secretory phenotype by promoting IL1A translation	Laberge R.-M.	Nature Cell Biology	Original article	No	USA	Molecular mechanism and genetics	Prostate	358

a Kruskal-Wallis test to compare Altmetric score among different categories. The Spearman rank correlation coefficient was used to describe the correlation between Altmetric attention scores and citation count or the number of mentions in Twitter. As well, the relationship between AAS and the journals' impact factors were assessed. Data analysis was performed in SPSS v.21.

Results

Totally, 27 articles were included for analysis in the final list and were sorted in Table 1 according to their citation, and the articles' characteristics were reported. Among all, 77.7% were original articles, 18.5% were reviews, and one was a note. The source country of most of these top-ranked articles was North America (51.8%) and Europe (397%), and only three articles were from other

Table 2. Altmetric Attention Score and Citation for the most cited articles

ID*	AAS/C**	News outlets	Blogs	Policy sources	Tweeters	Patents	Weibo user	Facebok pages	Wikipedia pages	Gogle+ users	Video uploader	Readers on Medely	Readers on CteU-Like	Research highlight platform	Dimensions	Peer review site	Red-ditors
12	2223/619	170	48	6	720	0	0	52	1	10	18	1408	0	0	634	0	2
5	827/1116	46	8	2	562	0	3	25	1	6	0	1186	1	0	0	0	0
2	697/1595	17	2	1	831	0	0	29	0	9	1	1420	0	0	1555	0	0
6	529/1103	43	8	1	213	1	0	10	0	1	0	740	0	1	1148	0	0
23	501/394	65	0	0	0	0	0	0	0	0	0	94	0	0	489	0	0
8	480/970	39	7	0	218	4	0	12	0	3	1	827	1	1	0	0	2
10	453/846	37	5	0	216	0	0	14	0	4	1	540	1	1	935	0	0
11	413/744	50	0	0	13	6	0	0	0	1	0	742	0	0	846	0	0
4	347/1263	29	7	0	105	6	0	4	0	2	0	1156	6	1	1318	1	0
13	232/619	11	8	0	164	1	0	9	0	2	0	1008	13	1	689	0	0
1	227/18248	19	4	5	36	13	1	3	2	2	1	8540	3	0	0	0	0
24	221/387	25	5	1	13	1	0	1	0	0	0	250	0	0	443	0	0
16	191/594	18	2	0	60	2	0	1	0	0	0	412	0	0	667	0	0
26	166/359	12	3	0	83	0	0	10	0	0	0	143	0	0	387	0	0
14	138/618	16	1	0	26	0	0	4	0	0	0	427	0	0	680	0	0
22	135/398	17	0	0	3	0	0	4	1	0	0	1413	0	0	461	0	0
7	106/1021	6	1	0	81	1	0	1	1	0	0	1098	3	0	1178	0	0
9	99/870	12	0	1	18	0	2	0	0	0	0	629	0	0	899	0	0
25	81/368	7	1	0	38	3	0	3	0	1	0	193	0	0	388	0	0
27	45/358	3	0	0	20	3	0	1	0	1	0	434	0	1	409	0	0
3	34/1311	1	1	0	26	1	0	2	0	0	0	561	0	0	1562	0	0
21	34/421	1	0	0	36	0	0	6	0	1	0	369	0	0	471	0	0
15	31/616	2	1	1	4	1	0	1	0	0	0	299	1	0	641	0	0
19	29/467	1	0	0	26	0	0	2	0	0	0	534	0	0	478	0	0
20	23/422	0	0	1	22	5	0	4	0	0	0	478	0	0	427	0	0
17	17/574	0	0	2	3	11	0	0	0	0	0	302	0	0	630	0	0
18	10/511	1	0	0	1	0	0	0	0	0	0	88	0	0	469	0	0

*ID: Citation rank; **AAS/C: Altmetric Attention Score (ASS)/ Citation

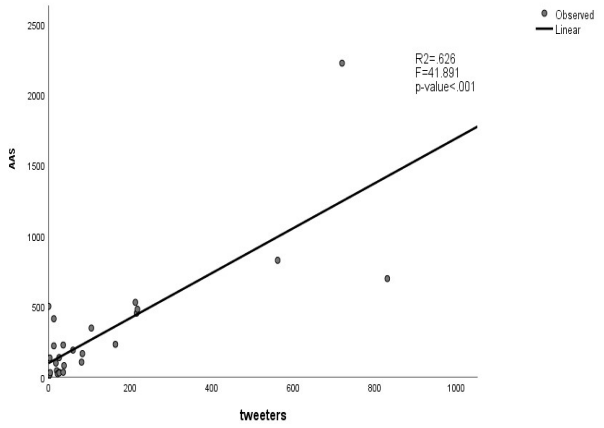

Figure 2. Relationship between AAS and mentions on Tweeters in all papers

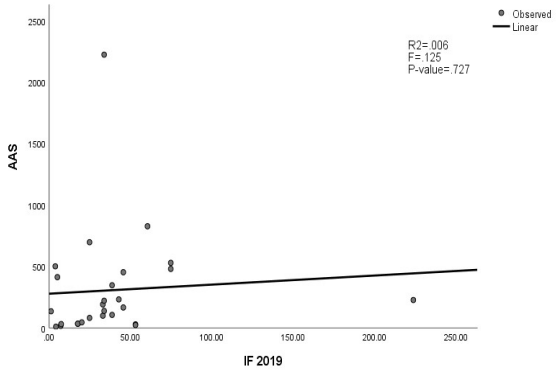

Figure 3a. Relationship between journals' impact factor (in 2015) and AAS

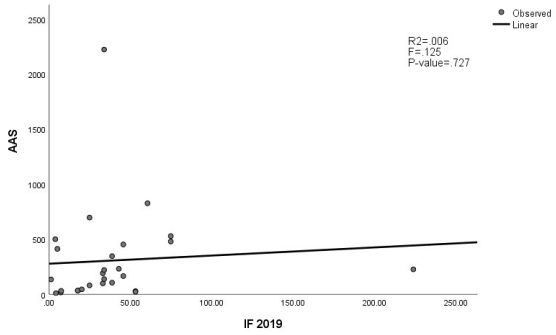

Figure 3b. Relationship between journals' impact factor (in 2019) and AAS

geographic areas. Ten top most-cited manuscripts were original articles, and those focused on epidemiological issues or treatment advances had higher citation values. The mean value of citation scores for articles published originally from the USA, Europe, and other countries were 2029.21±4682.79, 710±313.48, and 434.33±66.42, respectively (data not shown).

Table 2 shows the AAS for the included articles.

Table 3. Comparison of sciencemetric and altmetric indexes according to journals' accessibility status

	Open Access		
	No **Median** **(min-max)**	**Yes** **Median** **(min-max)**	**P-value**
Cited by	606 (358-18248)	744 (359-1595)	0.730
Altmetric Attention Score	120.5 (10-2223)	413 (17-697)	0.139
News outlets	11.5 (0-170)	29 (0-65)	0.145
Blogs	1 (0-48)	2 (0-8)	0.492
Policy sources	0 (0-6)	0 (0-2)	0.774
Tweeters	26 (1-720)	83 (0-831)	0.521
Patents	0.5 (0-13)	1 (0-11)	0.287
Weibo user	0 (0-3)	0 (0-0)	0.136
Facebook pages	2.5 (0-52)	4 (0-29)	0.654
Wikipedia pages	0 (0-2)	0 (0-0)	0.045
Google+ users	0 (0-10)	1 (0-9)	0.262
Video uploader	0 (0-18)	0 (0-1)	0.401
Readers on Mendely	547.5 (88-8540)	540 (94-1420)	0.430
Readers on CiteULike	0 (0-13)	0 (0-6)	0.690
Research highlight platform	0 (0-1)	0 (0-1)	0.150
Dimensions	474.5 (0-1562)	641 (0-1555)	0.430
Peer review site	0 (0-0)	0 (0-1)	0.228
Redditors	0 (2-11)	0 (0-2)	0.822

The highest AAS was for a note that was published in "Lancet Oncology" with the topic of "etiology and risk factors of prostate cancer". The second and third were two epidemiological articles about "global surveillance of cancer survival" and "The global burden of cancer" that were published in "Lancet" and "JAMA Oncology", respectively. Table 2 shows the traditional science metrics in comparison with the online attention score. However, Figure 1a shows there was no correlation between citation and AAS (r=0.03, P-value=0.952). Figure 1b shows that after eliminating two outlier articles from the study data, a statistically significant but weak correlation was observed between these indexes (r=0.56, P-value=0.003). Twitter had a significant role in online public attention, and there

Table 4. Comparison of article sources according to type of journals

Journals	N*	Journal Q in 2015	Journal IF in 2015	Journal IF in 2019
Cell	2	Q1	28.710	38.637
CA Cancer Journal for Clinicians	1	Q1	100.139	223.679
JAMA Oncology	2	Not indexed in SCImago	0	24.799
European Urology	2	Q1	14.976	17.581
The Lancet	1	Q1	31.981	60.392
New England Journal of Medicine	2	Q1	35.430	74.699
Journal of Clinical Oncology	2	Q1	17.467	32.956
Nature	1	Q1	26.445	42.778
Journal of Nuclear Medicine	1	Q1	6.203	7.354
European Journal of Nuclear Medicine and Molecular Imaging	1	Q1	1.761	7.081
The Lancet Oncology	3	Q1	30.483	33.752
Cancer Research and Treatment	1	Q1	4.959	3.761
JAMA - Journal of the American Medical Association	2	Q1	13.924	45.540
Nature Cell Biology	1	Q1	16.734	20.042
Nature Reviews Cancer	2	Q1	34.838	53.030
Chinese Journal of Cancer Research	1	Q3	2.201	4.135
Indian Journal of Clinical Biochemistry	1	Q3	1.050	1.140
Molecular Cancer Therapeutics	1	Q1	5.579	5.040

*Number of study articles published in each journal

was a significant correlation between AAS and twitter (r =0.79, P-value<0.001; Figure 2).

Table 3 shows the median value of citation, AAS, mentioned in Twitter, and almost all other evaluated indexes were higher in open access journals. However, the estimated values did not show a statistically significant difference (P-values>0.05). All article sources were Q1 journals, except for JAMA Oncology that was not in SJR Q ranking in 2015. In addition, the two Chinese and Indian journals were Q3. The journal's impact factor in publication date ranged from 0 to 100.1, shifting towards 1.1 to 223.6 in 2019 (Table 4). The correlation between AAS and journals' impact factor in 2015 vs. 2019 is demonstrated in figures 3a and 3b. There was only a very weak correlation between these factors. However, these finding were not statistically significant (respectively; r=.11, P-value=.557; r=.08, P-value=.727)

Finally, we compared the median value of AAS in different categories. AAS in open access journals (Median=413) was relatively higher than non-open access journals (Median=120.5). AAS in review articles was significantly lower than other types of articles. The median value of AAS in North American countries was higher than European and Asian countries. The AAS for Asian countries was higher than European ones. However, the reported ranges were too broad and in one article was only ten. The ASS reported for each article in Table 2 was relatively higher in American publications. Considering both median and range of values in Table 5, epidemiological articles had the highest online attention score.

Discussion

To our knowledge, no study so far has been conducted to explore the association between AAS and citation score in the urological cancer field. Expectedly, in the current study, following removing two outlier articles, a weak positive association between AAS and Scopus citation was found. According to the findings of Eabhann et al.,'s study that was performed on 100 urological articles with the highest Altmetric scores published in 2014 and 2015, a significant correlation was found between Altmetric score and number of citations per article and the impact factor of the journal (13). Likely, this positive correlation was replicated by Calopedose et al., among 22 urological articles (14). Currently, journals' impact factor neither in 2015 nor in 2019 had a significant association with AAS. Other studies in oral cancer (15), nursing (16), radiology (17), and urology (6) field reached the same result in this regard. This point highlights that the AAS of the article does not merely depend on the journal's impact factor, and other factors may have a role in gaining public attention. Although the study of Torre et al., had the highest citation counts, it ranked 11th in terms of AAS in the present study. This original article that was published in "CA: A Cancer

Table 5. Factors associated with Altmetric Attention Score in 28 articles

Factor		Number of outputs	Median of Altmetric Attention Score (min-max)	P-value
Article access	Non-open access	16	120.5(10-2223)	0.139
	Open access	11	413(17-697)	
Study type	Original article	21	191(10-827)	0.096
	review	5	34(23-413)	
	note	1	2223(2223-2223)	
Topic	Epidemiology	7	227(10-827)	0.180
	Treatment	7	166(34-529)	
	Molecular mechanism and genetics	8	108(23-413)	
	Diagnosis and early detection	4	32.5(17-453)	
	Etiology and risk factor	1	2223(2223-2223)	
Tumor type	Prostate	17	166(17-2223)	0.683
	Bladder	1	29(29-29)	
	Kidney	2	127.5(34-221)	
	prostate, bladder	2	117(99-135)	
	prostate, bladder, kidney	1	413(413-413)	
	prostate, bladder, kidney, testis	4	364(10-697)	
Geographic distribution	North America	14	178.5(23-697)	0.862
	Europe	10	127.5(17-2223)	
	Asia	3	135(10-501)	

Journal for Clinicians" journal with the impact factor of 223.67, investigated on the global several malignancies including prostate, bladder, kidney, and testis, scale and profiles as well as preventive measures. At last, they concluded that the incidence of malignancies because of the increase in life expectancy and worldwide population and carcinogenic behaviors, including tobacco usage, is sustainably rising (18). The study had the highest AAS, whereas was discussed about the relationship between red meat consumption and different malignancies (19). The article with the highest AAS was "Carcinogenicity of consumption of red and processed meat". This article made brief reports on the potential of red and processed meat as risk factors for malignancies, especially prostate cancer. Based on the article's topic, it is reasonable that the article had considerable popularity among people.

There were no significant associations between AAS and study type, topic, type of tumor, and geographic distribution in the present study. In the current study, most enrolled articles (approximately 78%) were original articles, and the review articles were placed as the second rank with the rate of 36%, which is similar to Mainwaring et al.'s study. In their study, 79% of bladder cancer articles with the highest citation were original, and 14% were reviewed, of which 8% were the review manuscript, and 6% were the meta-analyses manuscript (20). AAS and citation counts were higher in open access journals than non-open access journals, but these differences were insignificant. Likewise, Hassona et al., claimed no significant difference between open and non-open access journals in terms of AAS (15). Maggio et al., demonstrated a positive association between online attention and public accessibility of the articles with health profession education content (21). Virtually all of the articles were published in Q1 journals. Highly discussed topics in the included study were molecular mechanism and genetics (about 30%). Among four types of tumors, prostate cancer was of interest to the majority of studies. We thought this was not surprising because of the higher burden and prevalence of prostate cancer than other types.

Despite the many benefits of Altmetric, it encompasses a variety of problems that should be paid attention to; First, Altmetric measures the quantitative influence of an article in social media and would not measure the quality of research outcomes or influences. The method for calculating the Altmetric score is designed based on the beliefs of the developer of this method for each online. Bornmann et al. demonstrated that Mendeley and Twitter mentions have a superior association with citations; thus, they may have different contributions for the Altmetric score. Likely, in the present study, the impact of Twitter on social attention was considerable. Second, Altmetric scores can be manipulated conveniently by using fake Twitter accounts or robots. Therefore, may Altmetric scores not be fully trustable (22-25). However, in the present study, Altmetric scores were calculated using Altmetric explorer

that is less prone to manipulation among different means for measuring Altmetric. Third, due to discrepancies in penetration and usage of the Internet worldwide, Altmetric essentially does not indicate online attention of the whole countries (26). Finally, there is likely a bias in outcomes of Altmetric, which stems from higher rates of social media usage by younger individuals or authors than older ones. Nevertheless, Zhou et al., showed that authors' social media size is conversely associated with the authors' popularity (27).

As substantiate progress in the use of social media in the urology field is occurring, several top journals of urology, mainly BJU international and European Urology, have selected editors of social media in order to expand their online existence (14). These activities confer apparent benefits, including intensifying the influence of social media in academia and leading young researchers and urologists to be aware of social media, which play a crucial role in many training programs (28-30).

We acknowledge that our study had some strengths:

1. As far as we know, no study has evaluated the association between Altmetric scores and citation counts in highly cited urology articles with the urology cancer field of one specific year.
2. In the present study, we examined articles that were published in 2015. It is not plausible to compare articles of different years because articles published earlier have a higher chance of gaining more citations and Altmetric scores than published later (13).
3. We did not limit ourselves to journals that publish only urology subjects, and thus, we did not miss articles in the urology cancer field that were published in non-urology journals.
4. We performed the study on the articles published in 2015.

It is important to note that Altmetric can measure the impact of literature with higher velocity than traditional citation scores (6). Since approximately five years passed from the included articles' publication date, the time for articles to gain enough citations was enough; therefore, this led to not overestimate the impact of Altmetric.

Conclusions

For the first time, the present study examined the online attention toward urology cancer field articles with the highest citation number utilizing Altmetric data. The article with the highest AAS was not highly cited, and the article with the highest citation number had not the highest AAS. Moreover, we demonstrated that while there is a weak positive association between citation number and AAS, no significant association was observed between AAS and journals' impact factor, study type, study topic, articles access, type of tumor, and geographic distribution. We think the article impact will be assessed by a combination of altimetric and citation numbers in the future.

Authors' contributions
All authors contributed equally.

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Conflict of interest
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Data availability
Data will be provided on request.

Abbreviations

AAS	Altmetric attention score
IF	Impact factors
Q	Quartiles

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