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2018

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Sedghi, Shahram; Roudbari, Masoud Prof; Haseli, Maryam; and Tahamtan, Iman, "Accessibility and Types of Online Sources Cited in Scholarly Biomedical Journal in Iran" (2018). *Library Philosophy and Practice (e-journal)*. 1938.  
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## **Accessibility and Types of Online Sources Cited in Scholarly Biomedical Journal in Iran**

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## **Accessibility and Types of Online Sources Cited in Biomedical Journal in Iran**

### **Abstract**

One type of frequently used references in scientific papers is online references. The aim of this study is to study the prevalence, accessibility and types of online sources in biomedical journals in Iran from 2010 to 2012. We analyzed online references cited in 401 articles from 21 scientific journals indexed in PubMed, Web of Science, and Scopus. Findings revealed that only 73 papers (18.2%) had cited online sources in their references. of 186 online citations, 72 (38.7%) citations were accessible, and the URLs to 114 citations did not work (61.3%). The majority of unreachable citations were unstable citations (32.3%). Most online sources (62%) were cited in "Iranian Journal of Public Health". An increase in the number of online citations was observed over the studied years. The study indicated that the rate of online citations is low in the studied journals, and most online citations were unreachable. The lack of clear guidelines in citing online sources seemed to be a major reason for the inaccessibility of online citations.

**Keywords:** Online resources, Internet resources, Biomedical journals, Accessibility, URL, Online access

## Introduction

References in scientific literature are used to help scholars and researchers identify and locate sources used for conducting the study. Thus, references should be accurate and complete since it is essential that readers be able to check the main sources (1), and if required interpret the information that is being communicated from that sources or to use them for their own purpose, etc. (2).

With the development of Web, one type of frequently used references by researchers; is Web based resources (cited in form of URLs). Currently, 1% to 19% of articles cite at least one URL (3), however; URLs often suffer from the limitations that are usually related to the dynamic and ephemeral nature of the Internet: 1) the contents of the Web page may change over the time (2, 4) and 2) the resource identified by a URI may cease to exist. In both cases, the resource identified by the URL becomes inaccessible over time. There are concerns among scientific community about the quality and credibility of the information available and accessible in the Web sites (5). Despite the problems in accessing online references, authors cite reliable and relevant online items (1).

Citation accuracy and accessibility of online references, such as online journals are among the basic elements of reliable academic research (6). Accuracy of the information that are references such as the previously published articles is one of the most important aspects of academic writing that scholars or researchers should pay attention to (7). *“Correct citation of a reference let readers find further information on the subject of interest”* (4).

There are lots of studies on the situation of citations to online resources in different document. However, few studies are conducted on Iranian biomedical journals. Since Internet has an important role in finding the information resources for researchers, the current study was therefore conducted to investigate the trend in use of citation to URLs as well as the rate of accessibility to the citations from 2010 to 2012 in 21 journals published by Tehran University of Medical Sciences (TUMS).

## Methods

This is a citation analysis study focusing on biomedical journals published in Iran. The sample of the study was journals published by Tehran University of Medial Sciences (TUMS) which were indexed in at least in one of the three databases of PubMed, ISI or Scopus. We chose this first ranked medical university in Iran, because we believed that the journals published by this university would have more strict and clear author instructions, specifically for citing online sources. Of these journals, 21 were indexed in one of the three mentioned databases. Therefore, all the papers published in these 21 journals between 2010 and 2012 were analyzed. In total, these journals had published 2685 papers during these years. Using a stratified sampling method, 401 papers were chosen for analysis. The papers were obtained using the websites of journals, and were stored in a computer folder in pdf format. Then all the information regarding to the papers' citation were collected from the reference sections of the papers and all papers with Internet citations (citations to URLs) were determined for future analysis.

Thereafter, the URLs were copied and pasted in a Web browser such as Google Chrome to determine the accessibility and accuracy of the URL. Internet addresses provided us to the specific source rapidly and had enough stability, however; few of them did not lead us to the

paper source. Some of Internet addresses linked us to another source which indicated that the document has changed (ie. Internet URL after keyword searching links one to another source), or lead us to another document at the same source which indicated that the document omitted from the source. In some Internet addresses the address was wrong (for example citing to the home page of a site instead of the exact link of the source) or had typographical errors and after correction of the errors, it was possible to get the source (for example writing http// instead of http://). Sometimes for accessibility to the source, the authors had to search in search engine using some keywords. A URL was considered inaccessible if the Website was not shown or the error “404 not found,” or we saw any other error which indicated that the site could not be found. In such circumstances, the site was rechecked one to two days after the first check to make sure if the error is temporarily or not.

For managing the references we used Endnote. Data were collected via a check list and were imported into Excel.

## Results

### The rate of citations to Internet sources

In total, 73 papers had Internet citations (18.2%). As is shown in table 1, the papers with Internet citations have had increasing trend from 2010 to 2012 (Table 1).

Table 1: The frequency of papers with Internet citations in journals of TUMS from 2010 to 2012

| Year  | Total of papers | Papers with Internet citations | per cent |
|-------|-----------------|--------------------------------|----------|
| 2010  | 96              | 18                             | 18.8     |
| 2011  | 127             | 20                             | 15.7     |
| 2012  | 178             | 35                             | 19.7     |
| Total | 401             | 73                             | 18.2     |

### The type of Internet citation in the papers

From 186 Internet citations to the papers, 27 citations (14.5%) belonged to books, 27 citations (14.5%) belonged to papers, 11 citations (6%) belonged to reports, and 121 citations (65%) belonged to Internet citations such as thesis, abstract of seminars, conference papers etc. (Table 2).

Table 2: The frequency of the type of citations in journals of TUMS from 2010 to 2012

| Year           | 2010 | 2011 | 2012 | Total |          |
|----------------|------|------|------|-------|----------|
|                | No   | No   | No   | No    | per cent |
| Books          | 16   | 4    | 7    | 27    | 14.5     |
| Papers         | 5    | 15   | 7    | 27    | 14.5     |
| Reports        | 2    | 1    | 8    | 11    | 6.0      |
| Other sources* | 24   | 24   | 73   | 121   | 65.0     |

|       |    |    |    |     |       |
|-------|----|----|----|-----|-------|
| Total | 47 | 44 | 95 | 186 | 100.0 |
|-------|----|----|----|-----|-------|

\*. Theses, abstract of seminars, conferences etc.

### The situation use of Internet citation in the papers

Figure 1 presents the frequencies of paper in selected journals. As can be seen, Internet sources ranges from 1 to 62 citations. The most citations belong to the “Iranian Journal of Public Health” with 62 citations, “International Journal of Hematology-Oncology and Stem Cell Research” with 19 citations, and “Tehran University Medical Journal” with 13 citations. On the other hand, the three journals of “Tehran University Heart Center”, “Iranian Journal of Microbiology”, and “Iranian Journal of Allergy Asthma and Immunology” each with only one citation had the least citations. Furthermore, the “Journal of Dentistry of Tehran University of Medical Sciences” and “Journal of Arthropod-Borne Diseases” had no citation and are not shown in Figure 1.

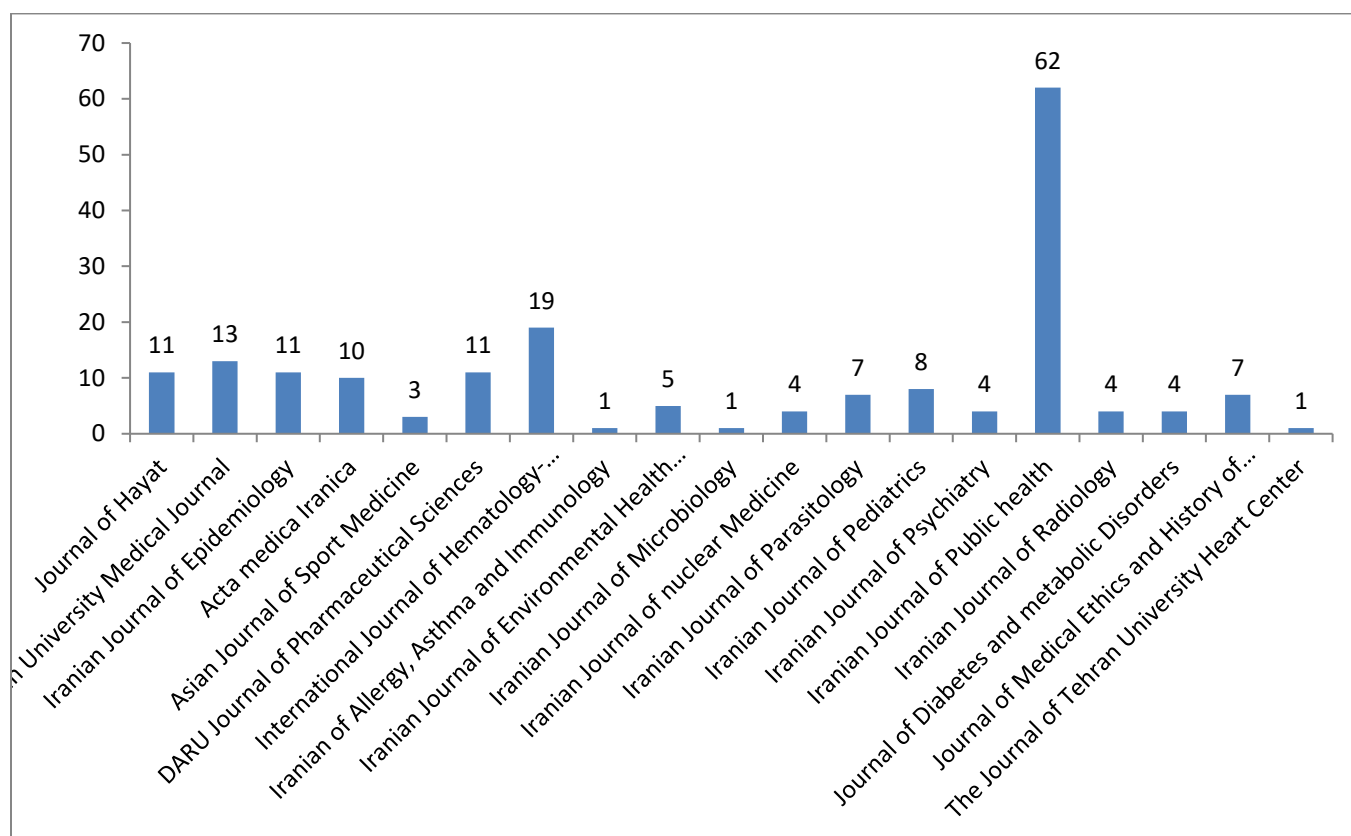


Figure 1: The frequencies of citation in selected journals of the TUMS from 2010 to 2012

### The stability of Internet sources in the papers

Table 3 shows that from 186 Internet citations during 2010 to 2012, only 72 citations were accessible (38.7%) and 114 citations were not inaccessible (61.3%). These unfound citations are divided into 60 (32.3%) unstable citations, 26 (14.0%) wrong or incomplete URLs, and 28 (15.0%) of the third type citations which were the URL addresses, which were omitted from the site or their addresses were changed.

Table 3: The frequency distribution of URL address according to stability in selected journals of the TUMS from 2010 to 2012

| Year  | Citations found via URL (%) | Citations not found via URL (per cent) |                                 |   | Total Internet citation |
|-------|-----------------------------|--|---------------------------------|---|-------------------------|
|       |                             | URL not found (%)                      | URL was wrong or incomplete (%) | The source was omitted from the cite/URL of cite was changed (per cent) |                         |
| 2010  | 10 (21.3)                   | 14 (29.8)                              | 14 (29.8)                       | 9 (19.1)  | 47 (100.0)              |
| 2011  | 18 (40.9)                   | 14 (31.8)                              | 4 (9.1)                         | 8 (18.2)  | 44 (100.0)              |
| 2012  | 44 (46.3)                   | 32 (33.7)                              | 8 (8.4)                         | 11 (11.6)   | 95 (100.0)              |
| Total | 72 (38.7)                   | 60 (32.3)                              | 26 (14.0)                       | 28 (15.0)   | 186 (100.0)             |

### Discussion and Conclusion

With the development of Web, internet has become an important source for accessing important information in the scientific and medical literature. However, URLs become inaccessible over time (3). Thus, in this study we decided to investigate to the prevalence and accessibility of online sources cited in the scholarly biomedical journals of TUMS. Our findings showed that 73 papers out of 401 had Internet citations (18.2%) and there were 186 internet citations in those 73 papers. Papers with Internet citations have had an increasing trend from 2010 to 2012 in the studied journals. The most citations belong to the “Iranian Journal of Public Health” with 62 citations, while the “Journal of Dentistry of Tehran University of Medical Sciences” and “Journal of Arthropod-Borne Diseases” had no citation. Of 186 Internet citations during 2010 to 2012, only 72 citations were found (38.7%) and 114 citations were not found (61.3%). The unfound citations included 60 (32.3%) unstable citations, 26 (14%) wrong or incomplete URLs, and 28 (15%) URL addresses which were removed from the site or their addresses were changed.

Our study showed that the use of online references has increased in the studied journals over time. Other studies such as the study by kiln et al (2014) and Habibzadeh (2013) has come to similar findings too. Habibzadeh (2013) reported that the number of articles with online references has increased 24 percent from 2006 to 2013. Moreover, kiln et al (2014) showed that the fraction of articles citing web references is growing over time. This study showed that one out of five science, technology, and medicine articles were not accessible after publication (2). Other studies confirmed these findings. For instance, two separate studies investigated 1,630 URIs in 2003 and 6,154 unique URIs in 2007 from the papers indexed in MEDLINE found that almost 20% of URIs were unreachable (8, 9). Another research on biomedical resources in PubMed showed that of 4699 papers published in 844 different journals, 403 (8.6%) papers had cited Internet resources and 9.1% of the citation were out of access (10). The results of Oermann’s research on web citations at nursing literatures, showed that more than one fourth of web citations were no longer accessible (11). Our study; however, showed that around 60 percent of URLs were not accessible and this shows a higher rate than the past studies. we noted that prestigious journals have more accessible online references than non-

prestigious journals. for example, one study showed that the ratio of URLs accessible was significantly higher in the prestigious journals compared to the low-profile journals (4).

Although the previous studies has reported difficulties in accessing to online resources, Sadat-Moosavi et al (2012) have shown that by using some refinement strategies including considering IE7 browse, manual editing, path depth reduction, searching into Wayback machine and the Google, the access rate of 2,886 URLs has increased by 30 percent. Thus, according to their studies by using such strategies the accessibility of online resources would improve to a great extent(6).

We classified the type of Internet resources, the most frequently used resources were theses, and seminar abstracts respectively followed by books and electronic paper.

Regarding to stability of Internet citations, the results showed that 38.7% of the sources were retrieved directly, and 61.3% were not reachable. However, the rates of accessible sources increased from 21.3% in 2010 to 46.3% in 2012. There were 114 (61.3%) out of access citations in our study, most of which were wrong or incomplete citations, and citations with changed or deleted URL addresses.

According to the above results, we conclude that the rate of Internet sources is low in the studied journals and most online citations were inaccessible. Readers of these papers would find only a small portion of the Internet resources published in the journals. This indicate that little attention is paid to the validity of online references by the authors of the papers published in scholar journals like those we studied.

### **Acknowledgements**

We would like to appreciate Tehran University of Medical Sciences for supporting this paper.



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