Completeness and accuracy of drug information in Wikipedia articles

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The study examined the quality of Wikipedia drug information in terms of completeness and accuracy compared to Medscape Drug Reference. Thirty commonly used drugs in Iran were identified and related articles were searched and retrieved via., Persian and English Wikipedia and evaluated based on 7 criteria (indication, dosage and administration, adverse events, contraindications, drug-drug interactions, use in pregnancy and lactation, and mechanism of action). Medscape Drug Reference was used to verify accuracy and completeness. The results of one sample t-test showed the mean of the criteria studied in the Persian and English Wikipedia were significantly lower than the highest achievable score of Medscape Drug Reference (P<0.0001). The mean (SD) score for quality (completeness and accuracy) was 17.23(9.19) and 26.43(7.23) out of 42 in Persian and English Wikipedia. Paired t-test showed that there was a significant difference between the quality of Persian vs. English articles (P<0.0001).

Introduction

The emergence of the Internet has seen even the medical students use websites such as Wikipedia to obtain medical information.[1] A study showed that 83% of women use the web to search for health information[2] another 2016 study found that 88% of the youth in Shiraz used the Internet to search for health information.[3] Other studies also show increasing of use the web to search for health information.[4-6] However, false or misleading information are potentially harmful and it is important to pay attention to the quality of information gathered from the internet. Researchers in recent years have examined and evaluated the quality of health information available through the Internet in various fields of medicine.[7-11]

Wikipedia, the multilingual encyclopedia (299 languages) is written by volunteers who have been given permission to use, edit and make any changes to their entries.[12] According to a 2013 study, it is the fifth most popular online site in the world[13] with more than 1,55,000 articles in the field of medicine in 255 languages[14] and its articles are ranked among the first ten results in search engines[15]. In recent years, many studies have been conducted on the evaluation of the quality of health information Wikipedia using standard tools[14, 16-26] but there is no study on the Persian Wikipedia.

Naumann has divided the criteria of information quality into three categories, including subjective, objective and process criteria. Subjective criteria are one of the most important criteria for assessing the quality of information and depend on the perception and receipt of the user. Naumann mentions factors such as credibility, conciseness, ability to interpret, relevance, credibility, comprehensiveness, and added value as criteria for subjective evaluation.[27]

Objective of the study

- To evaluate the quality of the Persian Wikipedia drug information using subjective criteria and to compare it with English Wikipedia.

Methodology

A descriptive-analytic study was carried out on Persian and English Wikipedia articles related to 30 commonly used drugs in Iran. The drugs were identified from the Food and Drug Administration of The Islamic Republic of Iran sales report (http://www.fda.gov.ir/en/). Articles were searched and retrieved on Persian and English Wikipedia. All articles were retrieved on April 27, 2018 and stored for later review.

To determine the accuracy and completeness of each article, a scoring system (Table 1) was adapted from an earlier study.[17] The scoring system includes 7 questions about the content of the source, indications, dosage and administration, adverse events, contraindications, drug-drug interactions, use in pregnancy and lactation, and mechanism of action

Scoring for each of the 7 questions was done once in terms of completeness and once in terms of accuracy. Score of 0 to 3 was given according to the information presented about each of the criterion and compared with Medscape Drug Reference (MDR) (https://reference.medscape.com/drugs). Each article can earn 42 points (21 points for completeness and 21 points for precision) if it earns the maximum points for each of the 7 criteria surveyed. Scoring was done by a specialist in the field of pharmacology.

SPSS 21 was used for statistical analysis. One sample t-test was used for comparing score of Persian and English Wikipedia articles with highest achievable Medscape score. The Kolmogorov-Smirnov test was performed for checking the normal distribution of data, and according to its results paired t-test or Wilcoxon signed rank test were performed for comparing quality score of Persian Wikipedia versus English version.

Results

The articles of 30 commonly used drugs (Appendix 1) in Persian and English Wikipedia were evaluated

Table 1—Completeness and accuracy scoring system

Score	Completeness scale	Accuracy scale
3	All items present	All items accurate
2	>50% of items present	>50% of items accurate
1	<50% of items present	<50% of items accurate
0	No items present	No items accurate

for completeness and accuracy based on 7 criteria (indication, dosage and administration, adverse events, contraindications, drug-drug interactions, use in pregnancy and lactation, and mechanism of action).

Table 2 shows the mean, standard deviation, minimum and maximum obtained scores by Persian and English Wikipedia articles.

Among the 7 studied criteria, 5 criteria showed a significant difference between Persian and English Wikipedia (Table 2). However, there was no significant difference between Persian and English Wikipedia on dosage and administration and contraindications. In overall, the average completeness of the articles in the Persian Wikipedia was 8.7, (95% CI= 5.2, 12) which was significantly lower than English Wikipedia with average score of 13.5, (95% CI= 9.8, 17.2) (P<0.0001) and the average accuracy of the articles in the Persian Wikipedia was 8.6, (95% CI= 5.6, 11.6) which was significantly lower than English Wikipedia with average score of 13, (95% CI= 9.3, 16.7) (P<0.0001)

The results showed that 10 articles (out of 30 articles) in the Persian Wikipedia and 2 articles (out of 30 articles) in the English Wikipedia do not provide any information on the dosage and administration. For the rest of articles, the average of dosage and administration is reported about one in both of language.

The lowest average score of completeness and accuracy in Persian Wikipedia belonged to Drug-drug interactions, 0.6 and 0.5 and in English Wikipedia to Contraindications, 1.1 and 1, respectively.

In Persian Wikipedia, Nitroglycerin SR 2.6mg TAB with a total score of 8 out of 42 has the lowest and Omeprazole 20MG CAP with a total score of 33 out of 42 has the highest score.

In English Wikipedia, the lowest score was for Bismuth Subcitrate 120mg TAB (10 out of 42) and Propranolol HCL 10MG TAB (37 out of 42) has the highest score.

One sample t-test showed that the mean of the completeness and accuracy in the Persian and English Wikipedia were significantly lower than Medscape Drug Reference (P<0.0001).

The total average score of quality (total score of completeness and accuracy) was equal to 17.23(9.19) and 26.43(7.23) for Persian and English Wikipedia.

Table 2—Analysis of the quality of Persian and English Wikipedia information

Criterion	Persian Wikipedia			English Wikipedia			
	Mean (SD)	Min	Max	Mean(SD)	Min	Max	P value
Total							
Completeness	8.7 (3.4)	4	18	13.5 (3.7)	4	19	<0.0001
Accuracy	8.6 (3)	3	15	13 (3.7)	6	18	<0.0001
Indication							
Completeness	2.2 (0.65)	1	3	2.8 (4.1)	2	3	<0.0001
Accuracy	1.8 (0.8)	1	3	2.4 (0.7)	1	3	<0.004
Dosage and Administration							
Completeness	1.1 (1)	0	3	1.2 (0.7)	0	3	<0.61
Accuracy	1.1 (1)	0	3	1.2 (0.6)	0	3	<0.72
Adverse Events							
Completeness	1.7 (0.9)	0	3	2..3 (0.8)	0	3	<0.024
Accuracy	1.8 (1)	0	3	2.4 (0.8)	0	3	<0.02
Contraindications							
Completeness	1.1 (0.7)	0	3	1.1 (1.4)	0	3	<0.245
Accuracy	1.1 (0.6)	0	3	1 (1.3)	0	3	<0.18
Drug-drug interactions							
Completeness	0.6 (0.9)	0	3	1.2 (1.3)	0	3	<0.022
Accuracy	0.5 (0.9)	0	3	1.2 (1.3)	0	3	<0.006
Use in pregnancy and lactation							
Completeness	1 (0.7)	0	3	2 (1)	0	3	<0.0001
Accuracy	1.1 (0.6)	0	3	2 (1)	0	3	<0.0001
Mechanism of action							
Completeness	1.4 (0.9)	0	3	2.8 (0.5)	1	3	<0.0001
Accuracy	1.6 (1)	0	3	2 (0.4)	2	3	<0.0001

The maximum achievable score was 42. Paired t-test showed that there was a significant difference between the qualities of Persian vs. English Wikipedia (P<0.0001).

Discussion

The results showed that Wikipedia have a significant difference in terms of completeness and accuracy in both Persian and English languages compared with Medscape Drug Reference.

The Persian Wikipedia's score in all criteria were lower than 2, expect for 'Completeness of Indication' criterion. Therefore, it seems that in most criteria, the Persian Wikipedia achieved less than 50% of Medscape qualification.

While the 21 was the maximum score for the completeness and accuracy of the articles examined, in the Persian Wikipedia, the average of the completeness was 8.7, and the average of accuracy was reported 8.6. This amount in English Wikipedia was 13.5 and 13, respectively.

Despite the fact that the English Wikipedia has a better quality than the Persian Wikipedia, in general, both languages have very low quality compared to Medscape Drug Reference. For example, the average completeness and accuracy of dosage and administration was reported in Persian Wikipedia, 1.1 and 1.1 and in EnglishWikipedia1.2 and 1.2, respectively. It means, less than 50% required information are presented in Wikipedia (both languages) on dosage and administration of drugs. Of course, this should also be taken into account because Wikipedia is also used by the public and not mentioning the dosage can be considered as the strength for Wikipedia because the full details of this information increase the risk of arbitrary use and complications arising from it. But Wikipedia offers incomplete information which may also create problems.

With the exception of the results of Kräenbring and his colleagues[18] that analyze accuracy and completeness of drug information in English and German, Wikipedia compared with standard

textbooks in the field of pharmaceutical sciences and their research results showed Wikipedia is an informative source for basic science students in the field of medicine. The results of other studies in this regard confirmed the results of current study and evaluated the responsiveness of Wikipedia to be lower in comparison with the available drug resources.[16, 17, 19, 24]

An earlier study showed that out of 1067 pharmacists, 28% use Wikipedia for pharmaceutical information and 12% suggest Wikipedia to their colleagues[28]. A study on the use of the Web 2.0 by 35 physicians indicated 70% of doctors use Wikipedia to search for information for clinical decision making and medical education[29]. Yet another study that examined the extent of social media use among pharmacists in West Virginia showed that out of the 50 pharmacists studied, 72% of them often use Wikipedia[30] and a review study on the status of the acceptance of social media by physicians indicated that Wikipedia, despite some occasional errors, is widely used as a reference tool by doctors[31].

Conclusion

Persian Wikipedia has a lower quality (completeness and accuracy) as compared with the English Wikipedia and has significant difference with Medscape Drug Reference in both Persian and English languages in terms of completeness and accuracy.

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Appendix 1

Medications Used for analysis

1. METFORMIN HCL 500MG TAB

2. ASA 80MG EC TAB

3. LOSARTAN POTASSIUM 25MG TAB

4. AMOXICILLIN 500MG CAP

5. RANITIDINE 150MG TAB

6. ATORVASTATIN 20MG TAB

7. METOPROLOL TARTRATE 50MG TAB

8. GLIBENCLAMIDE 5MG TAB

9. METRONIDAZOLE 250MG TAB

10. LEVOTHYROXINE SODIUM 0.1MG TAB

11. IBUPROFEN 400MG PEARL

12. AMLODIPINE 5MG TAB

13. BISMUTH SUBCITRATE 120MG TAB

14. OMEPRAZOLE 20MG CAP

15. ALPRAZOLAM 0.5MG TAB

16. SERTRALINE HCL 50MG TAB

17. NITROGLYCERIN SR 2.6MG TAB

18. PROPRANOLOL HCL 10MG TAB

19. CETIRIZINE 2HCl 10MG TAB

20. DICLOFENAC SODIUM SR 100MG TAB

21. KETOTIFEN FUMARATE 1MG TAB

22. ACETAMINOPHEN 500MG TAB

23. CLONAZEPA M 1MG TAB

24. VALPROATE SODIUM 500MG SR TAB

25. CAPTOPRIL 25MG TAB

26. CEFALEXIN

27. VITAMIN D3 (COLECALCIFEROL) PEARL

28. MEFNAMIC ACID 250MG CAP

29. CYPROHEPTADINE HCL 4MG TAB

30. DEXAMETHASONE 0.5MG TAB