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Scientific Research

Evaluating the Quality of Malaria-Related Health Information in the Nigerian Internet Context

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Abstract

Background: Patients and public are increasingly relying on Internet for health information. Health care providers are using internet for dissemination of health information. However, health information available on internet is not well regulated, and information quality varies greatly. Malaria is the leading cause of death and disease in many developing countries and has serious health burden around the world. The Internet could become a major resource for malaria education and information in Africa. This may potentially save millions of lives. The purpose of this study is to evaluate the quality of malaria health and treatment information available on the internet provided by the Nigerian context. Methods: Two key terms (malaria & treatment) were entered into three search engines: Google, Yahoo! and Bing. In order to retrieve articles as if the searches were conducted in Nigeria, the Local Area Network (LAN) settings were changed to a Nigerian proxy server, with a local Internet Protocol address. Three raters evaluated the quality of information using the DISCERN [9] instrument criteria. Kendall's concordance coefficient (*W*) was calculated to determine the level of agreement among the three raters. Results: Thirty-eight websites evaluated, and the highest inter-rater average score was attributed to the Patient.co.uk website, followed by Wikipedia web site and Malaria Site. The "Home Remedies for You" website received the lowest score. Most evaluated websites were .com domains. The highest average score was given to .co.uk domains while .int had the lowest score. Conclusions: Improving the quality of malaria-related health information could lead to empowering communities, engaging and assisting them to strengthen their health and social information sharing and support.

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Keywords

Malaria; Nigeria; Health; Information; Internet

1. Background

Malaria is the leading cause of death and disease in many developing countries and has serious health burden around the world [1]. In 2010, there were 24 million confirmed malaria cases in 106 malaria endemic areas or territories, with the majority of the cases occurring in Sub-Saharan Africa [2]. Specifically, 40% of all deaths caused by malaria can be accounted for in Nigeria, Congo and Dominican Republic [2].

The devastating disease burden has not gone unnoticed. There has been an increase concentration on malaria control efforts, and the issue is now on the political agenda of several of the world's wealthiest countries. Funds have become available from the Global Fund to Fight AIDS, Tuberculosis and Malaria, The US President's Malaria Initiative, the World Bank and bilateral donors, which have not been seen on this scale since the first attempted malaria eradication campaign in the 1950s and 1960s [3]. The Roll Back Malaria Partnership is now coordinating the global fight against malaria effort to reduce mortality, morbidity and economic consequences with major donor foundations, such as the Bill and Melinda Gates Foundation, which have greatly increased financial support for malaria research [3] [4]. Despite the wide scope of funding and concentration on malaria, eradication efforts have not been successful.

For reliable diagnosis of malaria, a combination of the methods of diagnosis is recommended, and training and better quality assurance should be established for the medical, laboratory and community health workers in order to improve malaria diagnosis [5]. Not only would providing open resources to access accurate and relevant information be a valuable resource for health care workers in Africa, but also individuals could become empowered to take control of their own health. The main sources of malaria information in Africa are currently family members, friend, community meetings, health facilities, radio, community health workers and print media [6]. The evidence suggests that social support systems are a valuable preferred resource to receive malaria information. The Internet could become a major resource to disseminate malaria education and information in Africa as accessibility continues to increase.

According to the United Nations Conference on Trade and Development [7] 2011 Information Economy Report, 84 million mobile handsets are already capable of using the Internet, and 7 out of 10 are expected to be Internet-enabled by 2014. Alone, mobile internet penetration in Africa has increased by 155.59 percent in two years [7]. Therefore, this is a pivotal time to evaluate the current state of malaria information on the internet. In return, high quality malaria information on the internet could strengthen the information exchanged through the social support systems, which remains as a preferred source of malaria information. A rapid increase in access and use of the internet exists in Africa. No studies to date have systematically assessed the quality of consumer health information in the internet available to the African user. The purpose of this study is to evaluate the quality of malaria health and treatment information available on the internet provided by the Nigerian context.

2. Methods

A total of 38 websites were included in the final evaluation (**Table 1**). The websites were found using three search engines: Google, Yahoo! and Bing. In order to retrieve articles as if the searches were conducted in Nigeria, the Local Area Network (LAN) settings were changed to a Nigerian proxy server, with a local Internet Protocol address. To simulate search patterns of novice internet users, the keywords used were limited to "malaria" and "treatment". Two searches were conducted in each search engine, the first used the keyword "malaria" and the second used the combination "malaria and treatment". At each search, the top 20 results from each of the 3 search engines were eligible for analysis, as a previous study suggested that users usually do not search beyond those [8]. Therefore, the searches resulted in 120 results. The Google search engine was used as the reference, and any repeated websites from Yahoo and Bing or from the second search were analyzed only once. In addition, links to books, reports, presentations, journal, magazine and newspaper articles were excluded as the target population is the general public and not specialized health care users (**Figure 1**).

Table 1. List of evaluated websites.

Website	URL	Average score
Bill & Melinda Gates Foundation	www.gatesfoundation.org/What-We-Do/Global-Health/Malaria	25
Buzzle	www.buzzle.com/articles/cerebral-malaria-symptoms-and-treatment.html	35
Centers for Disease Control and Prevention	www.cdc.gov/MALARIA/	36
Doctors without Borders	www.doctorswithoutborders.org/news/issue.cfm?id=2395	36
eMedicineHealth	www.emedicinehealth.com/malaria/article_em.htm	48
eMedTV	http://malaria.emedtv.com/malaria/malaria-treatment.html	38
Health 24	www.health24.com/Medical/Malaria/All-about-treatment/Treatment-of-malaria-20120721	31
Health Central	www.healthscout.com/ency/1/347/main.html	23
Home Remedies for You	www.home-remedies-for-you.com/remedy/Malaria.html	18
Kids Health	http://kidshealth.org/parent/infections/parasitic/malaria.html	29
Local Health	www.localhealth.com/article/malaria-1	29
Malaria Atlas Project	www.map.ox.ac.uk	33
Malaria Foundation International	www.malaria.org/	26
Malaria Site	www.malariasite.com/malaria/Treatment1.htm	59
Mayo Clinic	www.mayoclinic.com/health/malaria/DS00475	36
Medical News Today	www.medicalnewstoday.com/articles/150670.php	33
MedicineNet	www.medicinenet.com/malaria/article.htm	54
Medicines for Malaria Venture	www.mmv.org	48
Medline Plus	www.nlm.nih.gov/medlineplus/malaria.html	24
Medscape Reference	http://emedicine.medscape.com/article/221134-overview	57
National Health Service	www.nhs.uk/Conditions/Malaria/Pages/Treatment.aspx	44
NetDoctor	www.netdoctor.co.uk/medicines/treatments-for-malaria.shtml	50
News Medical	www.news-medical.net/health/What-is-Malaria.aspx	39
Nigerian Best Forum	www.nigerianbestforum.com/index.php?topic=8087.0	37
Only My Health	www.onlymyhealth.com/treatment-cerebral-malaria-1300866763	25
Patient	www.patient.co.uk/doctor/malaria	61
PubMed Health	www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001646/#adam_000621.disease.treatment	44
Society for Family Health	www.sfhnigeria.org/what-we-do/malaria-prevention-and-treatment	30
The Encyclopedia of Earth	www.eoearth.org/article/Malaria	41
The Free Dictionary	http://medical-dictionary.thefreedictionary.com/malaria	47
The New York Times	http://health.nytimes.com/health/guides/disease/malaria/	37
United Nations Children's Fund	www.unicef.org/health/index_malaria.html	27

Continued

WebMD	www.webmd.com/a-to-z-guides/malaria-topic-overview	45
Well on the Road	www.wellontheroad.com/illnesses/malaria4.html	32
Wikipedia	http://en.wikipedia.org/wiki/Malaria	59
Wise Geek	www.wisegeek.org/how-is-malaria-treated.htm	24
World Health Organization	www.who.int/topics/malaria/en/	34
Yahoo! Health	http://health.yahoo.net/health/malaria	36

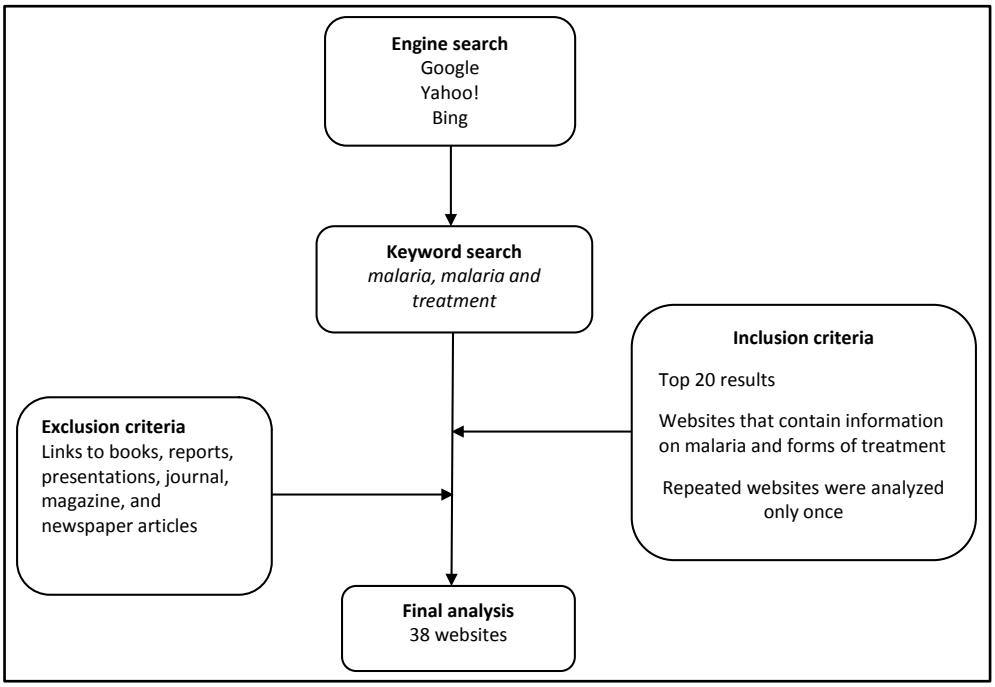

Figure 1. Flow chart of the search conducted to retrieve websites.

Three raters evaluated the quality of information using the DISCERN [9] instrument criteria. The evaluation was done considering the information available in different sections of the included websites. Links to external addresses, reports and other documents (such as .pdf or .doc) were not included in the evaluation of a specific website. Kendall's concordance coefficient (*W*) was calculated to determine the level of agreement among the three raters.

To assign a single quality score for each website, an average between the scores given by each rater was calculated. For each domain, an average score between all websites included in that domain was also calculated. SAS 9.3 (NC, Cary) was used to perform the data analysis.

DISCERN [9] is a standardized set of criteria for judging the quality of health information written for the public. Although DISCERN cannot be used to assess the scientific quality of the information, the instrument is useful to determine the reliability and quality of an information source without recurring to specialist knowledge or other publications and advisers [10]. As the purpose of this study was to evaluate consumer health information from the perspective of a novice Nigerian user, this validated instrument was sufficient to assess the quality of available information. DISCERN offers a list of 16 questions or criteria, each rated through a five-point scale ranging from one (No) to five (Yes) and it indicates if the quality criterion is present, partially present, or not present in the publication [10]. The total score assigned to a website could range from 16, representing the lowest level of quality, to 80, the highest level. Simplified user instructions are available at the website www.discern.org.uk.

3. Results

Among the 38 websites evaluated, the highest inter-rater average score was attributed to the Patient.co.uk website (average = 61), followed by Wikipedia web site and Malaria Site (average = 59) (**Figure 2**). The "Home Remedies for You" website received the lowest score (average = 18).Most evaluated websites were .com domains (47%, n = 18). Other domains were .org (26%, n = 10), .uk (11%, n = 4), .gov (8%, n = 3), .net (5%, n = 2), and .int (3%, n = 1). The highest average score was given to .co.uk domains (average = 47) while .int had the lowest score (average = 34) (**Figure 2**).

According to Landis and Koch [11] classification of degrees of agreement, the three raters had moderate (k = 0.4 - 0.6) to substantial agreement (k = 0.61 to 0.8) in all the DISCERN evaluation criteria (**Table 2**). The raters moderately agreed in 53% (n = 8) of the questions and substantially agreed in 47% (n = 7) of the questions. Responses to Question 2 (website achieves the aims proposed) depended on the response to Question 1 (aims of the website are clearly stated), and if the latter had scored 1 the former should not be considered relevant. Therefore, W could not be achieved for Question 2 using the SAS macro because all three raters had responses missing (R1 = 87%; R2 = 87%; R3 = 36%) due to the irrelevance of the question. The range of agreement was from W = 0.47 (p = 0.02) for Question 6 to W = 0.73 (p < 0.001) for Question 14.

4. Discussion

The quality of information related to malaria treatment available on the internet could be described as fair to medium, from the perspective of the user located in Nigeria. Not surprisingly, .co.uk domains received the highest average score among the three raters. Such result could be due to the DISCERN instrument being developed

Table 2. Inter-rater agreement for DISCERN questions.

Question	*W*	*p*-value	Level of agreement[†]
1: Are the aims clear?	0.56	<0.001[*]	Moderate
2: Does it achieve its aims?	.	.	N/A
3: Is it relevant?	0.54	0.001[*]	Moderate
4: Is it clear what sources of information were used to compile the publication (other than the author or producer)?	0.70	<0.001[*]	Substantial
5: Is it clear when the information used or reported in the publication was produced?	0.64	<0.001[*]	Substantial
6: Is it balanced and unbiased?	0.47	0.02[*]	Moderate
7: Does it provide details of additional sources of support and information?	0.70	<0.001[*]	Substantial
8: Does it refer to areas of uncertainty?	0.53	0.001[*]	Moderate
9: Does it describe how each treatment works?	0.58	<0.001[*]	Moderate
10: Does it describe the benefits of each treatment?	0.59	<0.001[*]	Moderate
11: Does it describe the risks of each treatment?	0.63	<0.001[*]	Substantial
12: Does it describe what would happen if no treatment is used?	0.50	0.007[*]	Moderate
13: Does it describe how the treatment choices affect overall quality of life?	0.55	<0.001[*]	Moderate
14: Is it clear that there may be more than one possible treatment choice?	0.73	<0.001[*]	Substantial
15: Does it provide support for shared decision-making?	0.62	<0.001[*]	Substantial
16: Based on the answers to all of the above questions, rate the overall quality of the publication as a source of information about treatment choices	0.65	<0.001[*]	Substantial

[*]Significant values; [†]Landis and Koch [11].

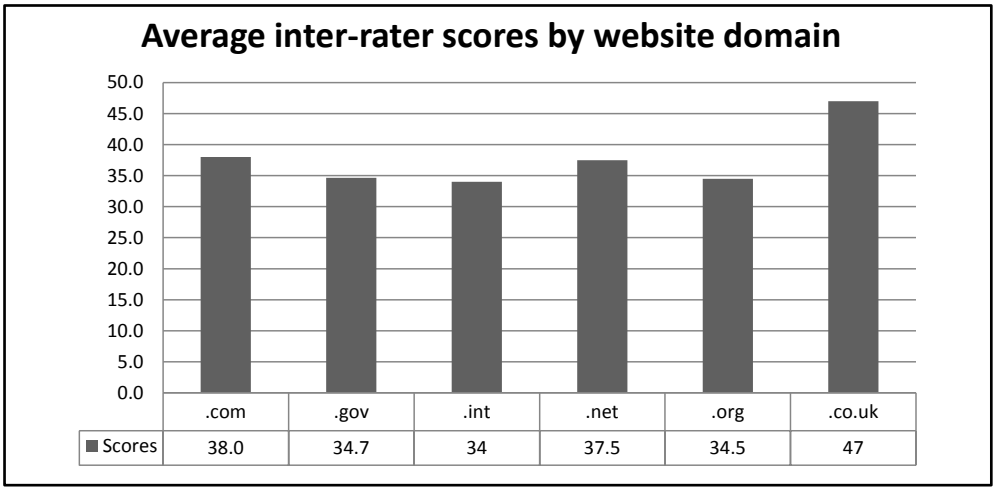

Figure 2. Inter-rater scores by domain.

by UK researchers and its standards being more commonly adopted and tested in UK practice [12] [13]. Agreement among the three raters was moderate to substantial across the 16 questions.

The study used a validated and established instrument to evaluate the quality of malaria-related information in the internet. The use of predetermined steps for the evaluation was important to reduce evaluator bias, and Kendall's concordance coefficient was properly used to assess agreement among the three evaluators. The study was limited to the use of English language for the keyword search, however, Nigeria adopted English as the official language. Although selection bias may be present, and websites with high-quality information may have not been detected, the selection criteria were equally applied based on the top results of commonly used search engines. The websites selected were representative of what is immediately available to a potential user in Nigeria.

The current study was limited to evaluating the reliability and quality of information on malaria and its diverse treatments. Future research should assess the accuracy of the provided information and also different aspects of malaria information such as symptoms and diagnosis. DISCERN could continue to be used to assess treatment-related information available on the internet of other important conditions.

Based on the results, possible recommendations include:

The DISCERN instrument is extremely useful to evaluate the quality and reliability of information related to treatment of diverse conditions. Clearly, it does not cover other information aspects, such as symptoms & diagnosis, and it cannot assess the accuracy & correctness of the information directly. Instruments that encompass a broader range of information quality should be developed.

Website content and development should be less centered in users from the developed world, and should begin to consider users from the developing world as their public. It is expected that US- or UK-based websites, for example, would target users from their own populations. It is important to note, however, that due to the global nature of the internet, users from all over the world can have access to these websites and, in fact, when the Nigerian IP was simulated, these websites appeared as top results in all the search engines.

Algorithm development by major search engines should take into account where the user is based and tailored the website results according to content relevance and user context.

Malaria control and prevention funding should be used for website development within endemic countries such as Nigeria. Content should focus on good prevention practices and available treatments in endemic areas.

Improving the quality of malaria-related health information could lead to empowering communities, engaging and assisting them to strengthen their social information sharing and support. Individuals should be provided with information that allows them to manage their own health, and the internet may be the future way for disseminating this information.

Conflict of Interest and Sources of Funding

The contents are solely the responsibility of the authors and do not necessarily represent the official views of CoPH. There was no financial or other form of conflicts of interest to any of the authors.

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