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Title: Evaluation of websites that contain information relating to malaria in pregnancy

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Keywords: Malaria; Online Health Information; Malaria in pregnancy; Information Quality

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Abstract: Objectives: The study identified available websites on malaria in pregnancy on the World Wide Web and sought to evaluate their readability and information quality.

Study design: A purposeful sample of websites were selected which provided information on Malaria in pregnancy.

Methods: 31 websites were identified from searches using Google, Yahoo and Bing search engines. Two generic tools (Discern and HON), one specific tool designed to assess information quality of malaria in pregnancy and readability tests (Flesch Reading Ease and Flesch-Kincaid Grade level) were used to evaluate the websites

Results: Most of the websites scored below 50% with the HON Code tool, with most lacking information on the symptoms. One website scored over 70 with the reading ease with two (2) achieving a score of 7 for the reading level test. The readability of the websites was too advanced for an ordinary consumer.

Conclusion: The results of this study indicated that the information quality of malaria in pregnancy websites varied from fair to medium. It was also found that the readability of the websites was too advanced for an ordinary consumer. These findings suggest that most websites are not comprehensive in addressing all the relevant aspects of malaria in pregnancy.

Highlights

- Quality health information on the web has potential to contribute towards helping pregnant women become more aware of the symptoms and asymptomatic signs of malaria in pregnancy.
- The aim of this study was to identify available websites on malaria in pregnancy on the World Wide Web and to further evaluate the information quality. 31 websites were identified.
- The results of this study indicated that the information quality of malaria in pregnancy websites varied from fair to medium.
- It was also found that the readability of the websites was too advanced for an ordinary consumer. These findings suggest that most websites are not comprehensive in addressing all the relevant aspects of malaria in pregnancy.

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[Identifying Information removed for peer review]

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Introduction

There were 212 million malaria cases and an estimated 429,000 malaria deaths in 2015, and pregnant women have the highest risk of malaria [1]. Quality health information on the web has potential to contribute towards helping pregnant women become more aware of the symptoms and asymptomatic signs of malaria in pregnancy. However, previous literature provides no evidence of an evaluation of the quality of this information, suggesting that perceived consumers may be in danger of accessing inaccurate information with potentially negative consequences.

Despite the global risk of malaria and malaria in pregnancy, a review of literature identified no evidence of the evaluation of the quality of health information on Malaria in pregnancy that is accessed on the World Wide Web. Despite users searching for information related to Malaria in pregnancy. Several studies have examined the quality of health information on a scope of pregnancy medical topics, while a previous study [2] focused on the quality of Malaria in general, with respect to treatments. However, this study did not report on the symptoms of Malaria in pregnancy for women.

There are several generic tools for evaluating websites that contain health-related information [3, 4], although the preference for tools vary. HON and DISCERN were found to be one of the most frequently used tools to evaluate the information quality of websites and were used in a range of

1 studies. Those found that used DISCERN were: Norovirus [3], Stroke [5], Breast cancer [6], Caesarian
2 section [7] Malaria [8]. HON was used by [5], Stroke, [8], Alzheimer's disease, [9], and Multiple
3 Sclerosis.
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6 The preference for both HON and DISCERN in studies by [3] and Surman [5] is not surprising. The
7 reason for this may be the fact that both tools offer a comprehensive approach to evaluation
8 addressing two aspects. Where one focuses on the quality of the website and the other on quality of
9 the information [5] Also both tools have been cited as widely used and established in previous
10 studies [2,4]. Therefore, based on their selection of both tools, it was therefore deemed relevant to
11 utilize these studies for this research.
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17 Websites were also assessed for their readability. Since Flesch was cited as one of the frequently and
18 easy to use tool to test readability, it was a better option considering that the study was conducted
19 in limited circumstances of time. Further the tool was selected because it has been shown to have a
20 simple formula for calculation.
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25 **Website selection**

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27 A total of 120 websites were selected, although after excluding duplicate hits and applying a
28 modified inclusion criterion [3], 31 websites were suitable for evaluation. Further, it was also found
29 that information specific to Malaria in pregnancy is not covered adequately in most of the websites;
30 this contributed to the reduced sample (31) used in this study compared to the recommended 40
31 websites [5] The inclusion criterion that was used is as tabulated below:
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- 39 • The content had to be based on Malaria in pregnancy and not malaria in general;
- 40 • The website should not be links to books and journals;
- 41 • The website should target a user who is not a specialized healthcare user;
- 42 • The website would not require registration or a password and could be accessed by anyone;
- 43 • The website would be English as the official Language of the target user is English
- 44 • The 31 websites were then captured in an offline environment due to the changing nature of
- 45 the Internet. These were then evaluated using an offline Google Chrome browser using a
- 46 Windows 7 operating system.
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54 **Information quality of websites**

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56 The results of this study indicated that the information quality of malaria in pregnancy websites
57 varied from fair to medium. It was also found that the readability of the websites was too advanced
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2 for an ordinary consumer. These findings suggest that most websites are not comprehensive in
3 addressing all the relevant aspects of malaria in pregnancy.

4 [Insert Table 1]
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7 **Discussion**

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9 The sample size (31) of the study was limited by time although not many quality websites are
10 available on malaria in pregnancy. A feasible evaluation should be given adequate time to allow for a
11 larger sample to avoid skewed results and verification of the disease specific tool if possible by
12 health professionals who are familiar with the disease being evaluated. Furthermore, the study did
13 not apply any checklist for accuracy and correctness of the information quality of the websites. More
14 so the researcher also lacked medical knowledge of the disease. A comprehensive study should have
15 an evidence based checklist based on evidence from literature on the disease, that is, if the
16 evaluation is not being conducted by a health professional for justification of the correctness and
17 accuracy of information quality.
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20 The other limitation was the lack of simulation of users from an endemic location of the disease to
21 further capture the actual needs of the consumers with the greatest need for information on malaria
22 in pregnancy. The study was conducted in an environment where the disease is less endemic such
23 that the actual perspective was not the exact simulation of a consumer from an endemic location. It
24 is therefore suggested that a similar study should be repeated addressing all the above limitations.
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27 **Conclusion**

28 In regards to the practical uses of our findings it should be noted that those who write information
29 related to that of malaria in pregnancy should ensure that the readability is suitable for the average
30 consumer. Additionally, our findings suggest that most websites are not comprehensible in
31 addressing all the relevant aspects of malaria in pregnancy, where possible this information should
32 be written in conjunction with medical professionals. We hope that this small opening of research
33 into malaria in pregnancy can fuel further research into this very important topic.
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36 **Author statements**

37 Project has no funding to declare.
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39 There are no competing interests to declare.
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41 Ethical approval was not required as there are no human participants.
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Quality of information on web-sites

Table 1 Ranking of each website against each tool and percentage score with each website evaluation tool and raw scores with reading tests The “=” symbol indicates where two or more websites achieved the same score with the same tool.

Site Name (Overall rank based on mean of five ranks)	Percentage score for tool (rank)			Readability (rank)	
	DISCERN	HON	Malaria Tool	FRE	FKGL
Royal College of Obstetricians &Gynaecologists (1)	87.5 (2)	53.75 (7)	101.25 (1)	30 (16)	13.8 (13)
National Institute Health Care and Excellence (2)	91.25 (1)	48.75 (8)	81.25 (3)	26.5 (18)	14 (12=)
Patient (3)	68.75 (6)	66.25 (2)	72.5 (4)	29 (7.2)	19.5 (1)
National Guideline Clearinghouse (4)	66.25 (7)	62.5 (4)	63.75 (7)	27.1 (17)	14.5 (11)
BabyCenter (5)	75 (4)	45 (11)	92.5 (2)	52.7 (5)	9.5(25)
Malaria site (6)	77.5 (3)	53.75 (7=)	68.75 (5)	16 (24)	14.9 (10=)
NEJM Journal watch (7)	65 (8)	58.75 (5)	56.26 (9)	14 (26)	16.6 (5)
CDC (8)	60 (9)	46.25 (9)	65 (6)	18.2 (21)	15.5 (8)
NHS Choices (9)	56.25 (11)	63.75 (3)	53.75 (11)	42.6 (8)	10.7 (22)
Net doctor (10)	57.5 (10)	56.25 (6)	51.25 (13=)	54 (4)	10.2 (24)
GP notebook (11)	70 (5)	53.75 (7=)	46.25 (16)	33.6 (14)	12.7 (17)
E medicine health (12)	56.25 (11=)	71.25 (1)	33.75 (22)	41.3 (9)	11.9 (20)
Wiki educator (13)	47.5 (16)	41.25 (13=)	63.75 (7)	40.4 (10)	12.1 (19)
IRIN Humanitarian news and analysis (14)	53.75 (12)	36.25 (16)	48.75 (15)	37.9 (12)	14 (12=)
WHO Features (15)	45 (17)	41.25 (15=)	51.25 (13=)	54 (4=)	11.1 (21)
Malaria.com (16)	50 (14)	31.25 (17=)	43.75 (17)	43.6 (7)	13.2 (14)
Wikipedia (17)	48.75 (15)	43.75 (12)	43.75 (17=)	25.9 (19)	15.7 (7)
Malaria in Pregnancy consortium (18)	43.75 (18)	41.25 (13=)	55 (10)	10.3 (27)	19.1 (2)
National Perinatal Epidemiology Unit (19)	45 (17=)	48.75 (8)	40 (18)	24.6 (20)	14.9 (10=)
WHO (20)	37.5 (21)	37.5 (15)	61.25 (8)	16.3 (23)	16.5 (6=)
Wellcome trust (21)	41.25 (20)	46.25 (10)	46.25 (16)	35.5 (13)	13.1 (15)
K4health (22)	45 (17)	38.75 (14)	50 (14)	32.5 (15)	13.9 (16)
Onlymyhealth (23)	42.5 (19)	14.25 (13)	43.75 (17=)	38.1 (11)	12.2 (18)
Maternal Health Task Force (24)	47.5 (16=)	15 (19)	53.75 (12)	8.8 (28)	18.1 (3)
Path (25)	52.5 (13)	36.25 (16)	36.25 (20)	10.3 (27=)	17.1 (4)
Bupa (26)	32.5 (23)	41.25 (13=)	48.75 (15)	48.5 (6)	10.4 (23)
Lonely planet (27)	36.25 (22)	43.75 (12)	35 (21)	69.2 (2)	6.8 (28)
Mumsnet (28)	42.5 (19)	38.75 (14)	28.75 (24)	61.4 (3)	8.7 (26)
National Malaria Control Centre (29)	32.5 (23=)	26.25 (18=)	38.75 (19)	17.7 (22)	16.5 (6=)
Nairaland forum (30)	30 (24)	37.25 (17=)	28.75 (24)	72.8 (1)	7.2 (27)
Medical geek (31)	27.5 (25)	26.25 (18=)	31.25 (23)	14.6 (25)	15(9)