ORIGINAL ARTICLE

Quality assessment of oral health promotion contents regarding caries, periodontal disease, and oral cancer through websites using discern instruments: a cross-sectional study

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ABSTRACT

Introduction: One way to improve public oral health is through conducting health promotion activities. As technology develops, the internet has been used as a medium for health promotion by presenting health content through websites. However, the use of these websites has the potential to provide inaccurate health information due to the flexibility of users in uploading health content without a prior regulatory process and review of the contents. This study aims to describe oral health promotion content quality through regarding caries, periodontal disease, and oral cancer websites using Discern Instruments. **Methods:** This study used the descriptive method with a cross-sectional approach. Samples were taken using the purposive sampling technique, with a total of 46 samples. The instrument consisted of 16 questions divided into three sections. The first section, comprising seven questions, focused on the reliability and accuracy of the presented health information. The second section, with eight questions, focused on the quality of information regarding treatment options. The final section, consisting of a single question, assessed the overall assessment based on the previous questions. The quality of the websites was assessed by two reviewers. The inter-rater reliability between the two reviewers was calculated using the Cohen's Kappa test. Data presentation included frequency distribution, mean, and standard deviation. **Results:** In this study, 33.3% of caries websites had low quality and 66.6% had moderate quality. In periodontal disease, 33.3% of websites were of low quality, 60% were of moderate quality and 6.6% were of high quality. In oral cancer, 26.3% were of low quality and 73.6% were of medium quality. **Conclusion:** The quality of dental and oral health promotion content on websites, assessed using the Discern Instruments, shows that most websites regarding caries, periodontal disease, and oral cancer have moderate quality, some have low quality, and only one website is of high quality.

KEYWORDS

Content quality, oral health promotion, website, Discern Instruments

INTRODUCTION

Dental and oral health is a multidimensional concept that involves various aspects, including the ability to speak, smile, sense of smell and taste, ability to touch, chew, and swallow functions, as well as the ability to express facial emotions confidently and without pain, discomfort, or disease related to the craniofacial complex.[1] On a global scale, the three main dental and oral health problems of concern are caries, periodontal disease and oral cancer.[2] Data from Basic Health

Research (Riskesdas) in 2018 shows that 57.6% of the Indonesian population adult and children experiences problems with teeth and mouth.[3] According to the data from Riset Kesehatan Dasar (Riskesdas), 88.8% of Indonesians suffer from caries and 74.1% from periodontitis.[4] These high prevalence rates indicate the urgent need for actions to reduce dental and oral health issues.

Dentists play a crucial role in raising public awareness of the importance of maintaining dental and oral health as part of the medical workforce. One of the efforts that dentists can make to improve the level of dental and oral health is by providing promotional health services.[5] Promotive health services focus on communities or individuals, enabling them to enhance their health status through empowerment and fostering independence. In addition to improving public health levels, health promotion is expected to increase people's motivation to maintain their health levels.[6] A number of studies indicate that dental and oral health promotion efforts can effectively improve dental and oral health in populations of various age groups.[7–9] Therefore, it is essential for dentists to engage in dental and oral health promotion activities, in accordance with technological developments and times.

The internet has become an integral part of human life.[10] In Indonesia, internet usage has been increasing annually. Based on data from the Indonesia Internet Service Provider Association (APJII), in 2018, internet users in Indonesia reached 171.17 million, or 64.8% of the total population of 264.16 million. In 2019, internet users in Indonesia increased to 196.71 million from a total population of 266.91 million, or 73.7%.[11] In 2023, a survey issued by the APJII revealed that 27.79% of the Indonesian population accessed health-related news content online.[12] Thus, the internet and health are inseparable entities that will continue evolving.

In carrying out health promotion activities, promotional tools or media are needed to convey health materials, materials, or messages to the public. Promotional media has an important role in the effectiveness of health promotion, and the types of media used can be adjusted to the needs and characteristics of the target.[13] One form of promotional media that is increasingly developing is digital media, particularly websites. Websites can be an effective tool for conveying health information to a broad audience. The advantages of using websites as a promotional medium include wide accessibility to present information interactively and flexibility in delivering health contents.[14] However, this flexibility can also be a drawback because no regulations govern content uploading. Therefore, filtering or screening health content uploaded to websites is essential to ensure the information meets quality standards.

Several studies have shown that online health content often lack quality.[15] This is evident when patients consult doctors with incorrect health information obtained from the internet.[16] This issue arises because online content is not subject to the regulatory and review processes required for publishing articles in scientific journals. As a result, uploaded health content can be considered inaccurate and untrustworthy.[17]

This study aims to determine the quality of dental and oral health promotion content related to caries, periodontal disease, and oral cancer on websites using Discern Instruments. To the best of the authors knowledge, this is the first study to assess the website quality of 3 topics at once, namely caries, periodontal disease and oral cancer.

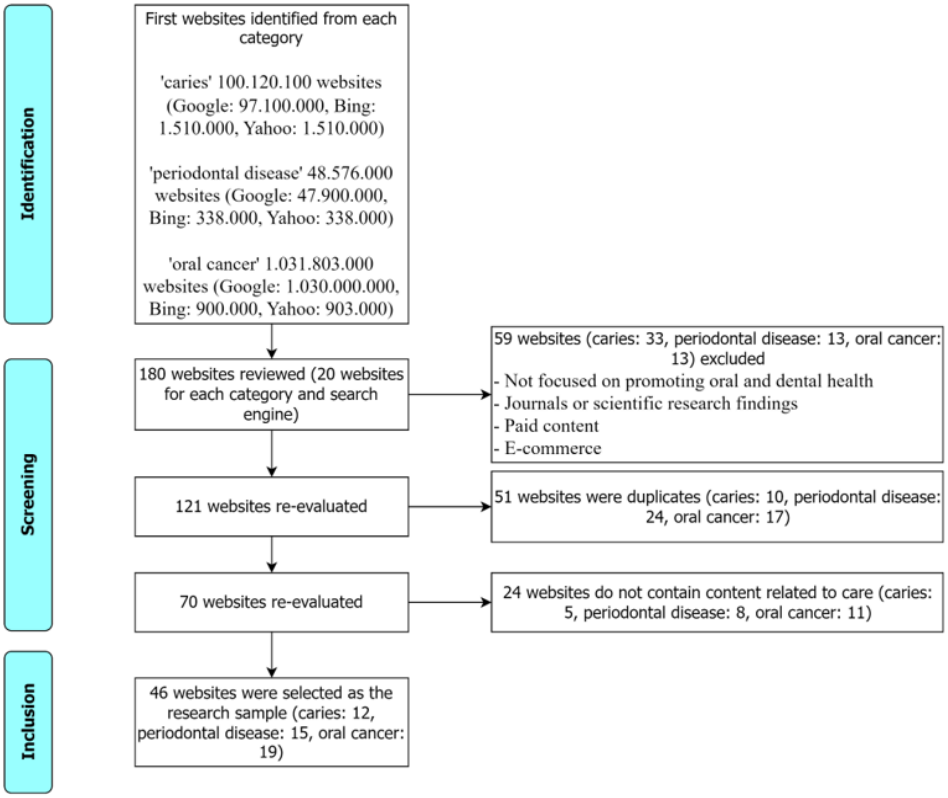
METHODS

This descriptive cross sectional study with non-probability sampling, specifically purposive non-random sampling. The population for this study consisted of websites found through the search engines 'Google', 'Bing', and 'Yahoo' using the keywords 'Caries', 'Periodontal disease', and 'Oral cancer'. These search engines were selected based on the tendency of internet users to seek information

online.[18] Internet users typically only read websites on the first page of the search engine results.[19] Therefore, this study selected the first 20 websites from each search engine for each category, and these websites were then filtered based on inclusion and exclusion criteria.

The inclusion criteria were that the websites had to be in English and provide information regarding dental and oral health promotion. Websites that did not focus on promoting dental and oral health, duplicates, journals or scientific research results, paid sites, and e-commerce websites were excluded from the study. Between July 9 and July 11, 2023, a total of 180 websites were reviewed from three search engines (Google, Bing, and Yahoo). After applying the exclusion criteria, 46 websites qualified as samples. Thus, the final sample consisted of 46 websites: 12 in the caries category, 15 in the periodontal disease category, and 19 in the oral cancer category. The detailed sample selection process can be seen in Figure 1.

Figure 1. Research sample selection process



The outcomes of this study are the quality of dental and oral health promotion content related to caries, periodontal disease, and oral cancer on websites, which comprise the reliability and accuracy of the information, the quality of information on treatment options, and the overall quality of the content separately for caries, periodontal disease, and oral cancer.This research uses the Discern Instruments as a measurement tool.[20] The Discern Instruments was discovered in 1999 by Deborah Charnock, Sasha Shepperd, Gill Needham, and Robert Gann. It is the first instrument designed to measure the quality of written health information.[20] The instrument consists of 16 questions divided into three sections. The first section consists of eight questions focusing on the reliability and accuracy of the presented health information. The second section includes seven questions and focuses on the quality of information regarding treatment options. The final section contains one question that assesses the overall assessment based on the previous 15 questions.[21] The scoring scale for each question in this instrument ranges from 1 to 5, with 1 indicating low quality and

5 indicating high quality.[22] This is further categorized into 1 to 2 points as low quality, above 2 to 3 points as moderate quality, and above 3 points as high quality. The total overall score ranges from 16 to 80 points which is further categorized into low quality with 16 to 32 points, moderate quality with 33 to 64 points, and high quality with more than 64 points.

The website evaluation was conducted online by two *reviewers,* accompanied by one coordinator. The measurement tool had previously been tested with the Content Validity Index (CVI) to assess the relevance of each question, resulting in valid outcomes.[18] The score of Content Validity Index (CVI) was 0.875. Training on the use of measurement tools and calibration was carried out beforehand. Subsequently, five websites were reviewed, and the inter-rater reliability was calculated to determine the consistency between the two reviewers using the same measurement tool. Inter-rater reliability was measured using the Cohen's Kappa test that obtained an agreement score of 0.845. Each reviewer then independently assessed all the websites. The research data are presented in the form of a frequency distribution table, and in mean and standard deviation. All calculations and statistical tests were performed using Microsoft Excel and IBM Statistical Program for Social Science (SPSS) Statistics 27.0.1.0.

RESULTS

The research was conducted on 46 samples consisting of websites from Google, Bing, and Yahoo using the search keywords 'caries', 'periodontal disease', and 'oral cancer'. An overview of the distribution of sample characteristics based on search engines and website categories can be seen in Table 1.

Table 1. Sample classification distribution

Classification	Caries (n = 12)		Periodontal Disease (n = 15)		Oral Cancer (n = 19)		Total (n = 46)	
	n	%	n	%	N	%	n	%
Search engine								
Google	4	33.3	11	73.4	15	78.9	30	65.2
Bing	4	33.3	3	20.0	2	10.5	9	19.6
Yahoo	4	33.3	1	6.6	2	10.5	7	15.2
Website category								
Government	3	25.0	3	20.0	6	31.6	12	26.1
Professional organizations			1	6.6	1	5.2	2	4.3
Non-profit organization	4	33.3	2	13.3	6	31.6	12	26.1
University/health services	3	25.0	6	40.0	5	26.3	14	30.4
General information	1	8.3	1	6.6	1	5.2	3	6.5
Other	1	8.3	2	13.3	0	0.0	3	6.5

Table 1 shows that out of the 46 samples studied, the majority of dental and oral health promotion content for various diseases on websites came from the search engine Google, totalling 30 websites (65.2%). The most common category was university/health service websites, with 14 websites (30.4%), followed by government and non-profit organizations with 12 websites (26.1%). The final assessment results of the quality of dental and oral health promotion contents on the 46 websites across 3 categories can be seen in Table 2.

Table 2. Final quality assessment results website

Classification	Score					
	low (16-32)		moderate (33-64)		high (65-80)	
	N	%	n	%	n	%
Caries (n = 12)	4	33.3	8	66.6	0	0
Periodontal disease (n= 15)	5	33.3	10	60.0	1	6.6
Oral cancer (n = 19)	5	26.3	14	73.6	0	0
Total (n = 46)	**14**	**30.4**	**31**	**67.4**	**1**	**2.1**

Table 2 shows that out of the 46 samples assessed for the quality of dental and oral health promotion contents on websites, 14 websites (30.4%) had low quality, 31 websites (67.4%) had moderate quality, and only 1 website (2.1%) had high quality. Regarding websites on oral cancer, almost three-quarters had moderate quality. Almost two-thirds of websites on caries and periodontitis had moderate quality, and one-third exhibited low-quality content. Detailed results of the Discern Instruments assessment in the caries categories can be seen in Table 3.

Table 3. Results of content quality assessment in caries categories

Question	Mean	SD	Classification
Q1. Clear goals	3.17	0.78	high
Q2. Achieved goal	3.25	1.34	high
Q3. Relevant	2.83	1.13	moderate
Q4. Clear reference source	2.96	1.71	moderate
Q5. Clear reference date	2.75	1.75	moderate
Q6. Balanced and unbiased	2.46	1.03	moderate
Q7. Additional information	3.25	1.47	high
Q8. Uncertainty	2.21	0.96	moderate
Q9. Treatment mechanism	3.67	1.67	high
Q10. Benefits of treatment	2.46	1.27	moderate
Q11. Risks of treatment	1.88	0.74	low
Q12. Effects of no treatment	3.38	1.64	high
Q13. Effects on quality of life	1.92	0.90	low
Q14. Possible more than one treatment	3.79	1.44	high
Q15. Joint decision making	2.58	1.16	moderate
Q16. Overall value	2.88	1.19	moderate
The final result	45.42	16.90	moderate

Table 3 shows that in the category of caries, out of the 16 questions, only 6 questions (Q1, Q2, Q7, Q9, Q12, and Q14) had an average score above 3 indicating that the content is of high quality for these criteria. In this category, Q14 (possibility of more than one treatment) received the highest average score of 3.79 ± 1.44. Q11 (risk of treatment) received the lowest average score of 1.88 ± 0.74. Detailed results of the Discern Instruments assessment in the periodontal disease category can be seen in Table 4.

Table 4. Results of content quality assessment in periodontal disease categories

Question	Mean	SD	Classification
Q1. Clear goals	3.13	0.67	high
Q2. Achieved goal	2.93	0.98	moderate
Q3. Relevant	2.67	0.92	moderate
Q4. Clear reference source	2.97	1.86	moderate
Q5. Clear reference date	2.5	1.66	moderate
Q6. Balanced and unbiased	2.6	1.33	moderate
Q7. Additional information	2.83	1.28	moderate
Q8. Uncertainty	2	0.82	moderate
Q9. Treatment mechanism	3.17	1.6	high
Q10. Benefits of treatment	2.47	1.42	moderate
Q11. Risks of treatment	1.77	0.94	low
Q12. Effects of no treatment	2.13	1.27	moderate
Q13. Effects on quality of life	2.1	1	moderate
Q14. Possible more than one treatment	3.67	1.29	high
Q15. Joint decision making	2.7	1.22	moderate
Q16. Overall value	2.73	1.03	moderate
The final result	42.37	16.41	moderate

Table 4 shows that in the periodontal disease categories, out of the 16 questions, only 3 questions (Q1, Q9, and Q14) had an average score above 3. In this category, Q14 (possibility of more than one treatment) received the highest average score of 3.67 ± 1.29. Q11 (risk of treatment) received the lowest average score of 1.77 ± 0.94. Detailed results of the Discern Instruments assessment in the oral cancer categories can be seen in Table 5.

Table 5. Results of content quality assessment in oral cancer categories

Question	Mean	SD	Classification
Q1. Clear goals	3.16	0.6	high
Q2. Achieved goal	2.58	0.69	moderate
Q3. Relevant	2.63	0.62	moderate
Q4. Clear reference source	2.58	1.28	moderate
Q5. Clear reference date	2.11	1.25	moderate
Q6. Balanced and unbiased	2.24	0.63	moderate
Q7. Additional information	3.34	1.08	high
Q8. Uncertainty	2	0.58	moderate
Q9. Treatment mechanism	3.34	1.12	high
Q10. Benefits of treatment	2.39	1.17	moderate
Q11. Risks of treatment	1.95	0.93	low
Q12. Effects of no treatment	1.76	0.63	low
Q13. Effects on quality of life	2.37	0.74	moderate
Q14. Possible more than one treatment	3.79	1.21	high
Q15. Joint decision making	2.95	0.96	moderate
Q16. Overall value	2.95	1.1	moderate
The final result	42.13	11.0	moderate

Table 5 shows that in the oral cancer categories, out of the 16 questions, only 4 questions (Q1, Q7, Q9, and Q14) had an average score above 3. In this category, Q14 (possibility of more than one treatment) received the highest average score of 3.79 ± 1.21. Q12 (effect of no treatment) received the lowest average score of 1.76 ± 0.63. The final assessment results of the website quality based on their classification can be seen in Table 6.

Table 6. Rating result content quality based on affiliation website

Affiliate *website*	Score						Mean	SD
	low (16-32)		Moderate (32-64)		High (65-80)			
	n	%	n	%	n	%		
Government (n = 12)	5	41.6	7	58.3			36.13	10.99
Professional organizations (n = 2)	1	50			1	50	46.25	26.52
Non-profit organizations (n = 12)							44.79	12.94
University/health service (n = 14)	2	14.2	12	85.7			48.5	1.8
General information (n = 3)			3	100			23.17	5.51

Table 6 reveals that half of the professional organisation websites were of high content quality, and the majority of the non-profit and university websites had moderate content quality, while almost half of the government websites comprised low-quality content.

DISCUSSION

Based on the research results, the quality of dental and oral health promotion contents on websites using Discern Instruments shows that the quality of websites, whether regarding caries, periodontal disease, or oral cancer, still does not meet high standards. This aligns with research conducted by Aboalshamat on the websites in the caries category, Kanmaz et al. on the websites in the periodontal disease category, Alakhali on the websites in the oral cancer category, McMorrow et al. on the websites in the adult orthodontic device category, and Kuter et al. on the websites in the pediatric restorative care category, where the majority of websites did not have good quality based on the Discern Instruments assessment.[24–28] According to previous studies and the current research, the quality of health content presented on websites is still lacking. Therefore, as the internet continues to grow, the quality of health content presented on websites must also be continually improved.

Regarding the website content on caries, Table 2 reveals 4 websites (33.3%) received low quality scores, 8 websites (66.6%) were of moderate quality, and none met high quality standards. These results align with the study conducted by Aboalshamat, which found that 32.35% of websites containing

caries were of low quality, 67.65% were of moderate quality, and none were of high quality.[24] Similar findings were observed in the study by Alkhuwaiter et al., which examined the quality of Early Childhood Caries content on Arabic-language websites using a different quality assessment tool and found that the majority of websites had poor quality.[30]

This indicates that websites containing dental and oral health promotion contents on caries topics, in this study and previous studies, have generally medium quality, even though different content quality assessment tools were used. According to Table 3, question Q14 regarding the possibility of more than one treatment received the highest score with an average of 3.79 ± 1.44. This means that the majority of websites in the caries category explain alternative treatments in their health promotion contents. Question Q11, concerning the risks of treatment, received the lowest score in the caries category with an average of 1.88 ± 0.74. Similar results were found in the study by Zaki et al., where in the assessment of website quality regarding dental hypomineralization treatment, question Q14 received the highest score and question Q11 received the lowest score.[29]

In terms of the website content on periodontal disease, Table 2 shows that 9 out of 15 (60%) websites exhibited moderate quality, 5 out of 15 (33.3%) websites received low quality, and only 1 website (6.6%) was deemed to have high quality. This indicates that while most websites containing dental and oral health promotion contents in the periodontal disease category already show adequate quality, there is a pressing need for further improvements to enhance the quality.

According to Table 4, similar to the caries category, question Q11 received the lowest score with an average of 1.77 ± 0.94. This was due to the contents on these websites, which did not comprehensively explain the potential risk of each treatment or provide any form of explanation. These findings are consistent with the study by Daltaban et al., which found that 83% of Turkish-language periodontal disease websites did not explain treatment risks such as gingival recession or hypersensitivity.[31] This is also in line with the study by Kanmaz et al., which found that 85 English-language periodontal disease websites (94.4%) did not include explanations of the treatment risks.[25]

About the websites on oral cancer, based on Table 2, 5 websites (26.3%) received low-quality scores, 14 websites (73.6%) had moderate-quality scores, and no websites achieved high-quality scores. This indicates that while the websites with dental and oral health promotion contents in the oral cancer category show an adequate level of quality, there is a need for further improvement in the quality of the information presented. These findings align with the study conducted by Alakhali, which found that the majority of Arabic-language websites discussing oral cancer still do not meet high quality standards and require quality improvement.[26]

As shown in Table 5, Q14, concerning the possibility of more than one treatment, received the highest score with an average of 3.79 ± 1.21. This indicates that the majority of websites explain the various treatments available for oral cancer. This result is consistent with the study conducted by Huynh et al. on the quality of websites concerning benign vascular tumours, which also found a high score for Q14 compared to the other questions.[31] In the oral cancer category, Q12, which addresses the effects of not undergoing treatment, received the lowest score with an average of 1.76 ± 0.63. This is similar to the study by Charow et al., which found that Q12 received low scores on websites about anal cancer, with 89% of the websites scoring very low or 1-2.[31]

Based on Table 6, websites affiliated with universities/health services received the highest average scores compared to the other websites, with a score of 50.18 ± 14.19. This aligns with the study by Kiran et al. on the quality of websites concerning the eruption of baby teeth. Their research showed that the website my.clevelandclinic.org, managed by a clinic, received the highest score

compared to other websites.[34] Similarly, Al-Ak'hali et al. found that websites with health/professional affiliations had the highest quality score compared to other affiliation categories for periodontal disease.[16]

This is because the authors of these websites have an academic background that supports the creation of high-quality health promotion contents. Additionally, authors of university/health services-affiliated websites uphold professional values and transparency in disseminating health information to the public. However, this differs from the study conducted by Schwendicke et al. on periodontitis websites managed by dentists in Germany. Their study found that the majority of periodontitis websites managed by dentists had poor quality and were less reliable.[35] This could be caused by the inadequate provision and presentation of information on German-language websites managed by dentists.

In this study, websites with 'other' affiliations received the lowest average score of 23.17 ± 5.51. Upon further investigation, it was found that two websites in the 'other' affiliation category were commercially oriented, selling specific health products. This aligns with the findings of Al-Ak'hali et al., which indicated that commercial websites typically have lower quality.[16] This is because commercial websites tend to prioritize product promotion over maintaining high-quality health content.

In this study, websites affiliated with universities/health services achieved the highest quality scores in the caries and oral cancer categories, specifically the website mayoclinic.org. For the periodontal disease category, the highest quality score was achieved by a website affiliated with a professional organization, namely the ADA (American Dental Association) website. The lowest quality scores in the caries and periodontal disease category were from websites with 'other' affiliation, specifically the UFC group and Corsodyl websites. For the oral cancer category, the lowest score was from a government-affiliated website, medlineplus.gov. These findings are consistent with the Taran et al. study, which found that government-affiliated websites received both the highest and lowest scores in research on the quality of websites about fluoride.[36] To address the differences in quality scores among various websites affiliation, creating clear guidelines for sharing high-quality health information online is important. Also, regular checks and updates by experts can also ensure that all websites can provide reliable and high-quality information to users, no matter their affiliation.

This study has limited sample selection, focusing only on the first 20 websites from each search engine. However, this is based on the common behaviour of internet users when searching for information. Subjectivity in website quality assessment also poses a limitation, even though training and calibration among reviewers were conducted and the Discern Instruments handbook was used as a reference for evaluating website quality. Another limitation is the sample period, as samples were accessed only from June 9-11, 2023. Due to the flexibility of the internet, a future search using the same keywords may yield different websites. Future research could include a larger sample size and employ various website quality assessment tools for comparison. Involving several other reviewers from different fields could provide evaluation results from various academic perspectives.

CONCLUSION

The quality of dental and oral health promotion content on websites, assessed using the Discern Instruments, shows that most websites regarding caries, periodontal disease, and oral cancer have moderate quality, some have low quality, and only one website achieved high quality. The implications of this research underscore the necessity for dental providers and the wider community to recognize the quality of dental and oral health promotion content available on websites. Furthermore, it highlights the importance for health service providers to

prioritize the quality of health promotion in order to enhance the quality of knowledge transfer concerning dental and oral health and offer comprehensive and valuable information on dental and oral health knowledge.

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