

Quality and readability of internet-based information on halitosis

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Objective. To evaluate quality and readability of Internet-based information on halitosis.

Study Design. An Internet search through 3 engines (Google, Yahoo, and Bing) was done with the terms (“bad breath,” “halitosis,” “oral malodor,” “foul breath,” “mouth malodor,” “breath malodor,” “fedor ex ore,” “fedor oris,” “ozostomia,” and “stomatodydodia”). The first 50 websites from each engine resulting from each search term were screened. Included websites were evaluated using Health on the Net (HON) criteria, *Journal of American Medical Association* (JAMA) benchmarks, DISCERN, Ensuring Quality Information for Patients (EQIP), Flesch Reading Ease (FRE) score, and Flesch-Kincaid Grade level.

Results. A total of 101 websites were included. HON, DISCERN, EQIP, and FRE score were 42.9%, 37.6%, 37.4%, and 51.9% of the maximum score, respectively. Fewer than 50% of sites displayed attribution, disclosure, and currency according to JAMA benchmarks. HON score, DISCERN score, and EQIP score had significant correlation with each other and were significantly higher in sites displaying the HON seal.

Conclusion. The current quality and readability of informative websites on halitosis are generally low and poorly organized. Clinicians should be able to assess the Internet-based information on halitosis, as well as give accurate advice and guide patients concerning this issue. (*Oral Surg Oral Med Oral Pathol Oral Radiol* 2017;■■■:■■■-■■■)

The Internet is one of the most popular and important sources to gain health and medical information for both patients and the public in general.¹ Currently, 49.7% of the world population can access the Internet, and the growth of Internet users was a surprising 936.0% from the year 2000 to 2017.² Reports indicate that more than 50% of adults use the Internet to look up health information more than once a month. A recent United State survey reported that around 80% of the Internet users search for health or medical information.³ A European survey of 2007 reported that 71% of the users had approached the Internet for health reasons.⁴ Results indicate that search topics range from a specific disease to medical treatments and even lifestyle issues such as diet, nutrition, exercise, and fitness.³ And the majority of Internet users believe that the information is of good quality and reliable.⁵

The biggest advantage of information on the Internet, its high accessibility, acts as a double-edged sword. Web-based information is unregulated both for user and

provider, and it is relatively difficult for the layman user to distinguish accurate medical information from inaccurate commercial sources.⁶ Many health professionals are concerned that Internet information can be puzzling, overwhelming, and harmful without proper guidance.⁶⁻⁸ This has brought along the question of how to evaluate the quality and accuracy of medical information on the Internet and has led to the development of validation methods to assess the quality of health-related Internet sites.⁹⁻¹⁴

Halitosis is an unpleasant odor originating from mouth breath.^{15,16} Studies indicate that it affects around 6%-50% of the general population, ranking it as the third most common reason for people to seek dental treatment after dental caries and periodontal disease.¹⁷⁻¹⁹ Halitosis is unique as a disease entity since it is considered unacceptable and viewed as a taboo in many societies. Patients suffering from halitosis are known to be more susceptible to anxiety, depression, and psychosocial embarrassment that further lower one's quality of life.²⁰ Although halitosis is not a life-threatening disease, those who are afflicted are known to experience high levels of psychological suffering.²¹ Halitosis is known as a multifactorial condition involving both oral and nonoral

Conflict of Interest and Source of Funding Statement: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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Received for publication Aug 28, 2017; returned for revision Nov 10, 2017; accepted for publication Dec 1, 2017.

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2212-4403/\$ - see front matter

<https://doi.org/10.1016/j.oooo.2017.12.001>

Statement of Clinical Relevance

Patients suffering from halitosis are increasingly seeking and depending on Internet-based information. However the current quality of websites carrying halitosis-related contents are generally low and inaccurate based on analysis using various accredited evaluation tools for health-related websites.

conditions such as upper and lower respiratory tract and gastrointestinal/endocrinological disorders and systemic diseases, as well as psychological problems. In the case of intraoral halitosis, volatile sulfur compounds (VSCs) produced by microbiota of the subgingival areas and tongue dorsum have been regarded as major constituents of the malodorous gas, but the underlying microbial causation is poorly understood and the exact pathophysiology is still to be fully elucidated.^{19,22,23} So currently applied management approaches mostly focus on the mechanical and/or chemical reduction of already existing VSCs and eradication of VSCs producing microorganisms in the oral cavity based on empirical evidence, leading to low treatment effectiveness and patient satisfaction.^{19,24} The combination of the psychological burden and lack of scientific evidence concerning both pathophysiology and treatment makes the halitosis patient seek and depend on Internet information. Information on halitosis was sought by 12.5% of the users who search for dental information on the Internet.²⁵ In spite of the potential harm that could be inflicted by inaccurate Internet-based information on an already psychologically vulnerable patient, no previous study has attempted to evaluate the quality of online information on halitosis.

The aim of this study was to evaluate quality and readability of websites carrying information on halitosis using various accredited tools, to provide guidelines for both clinicians and patients regarding the accuracy of information on halitosis from websites.

MATERIALS AND METHODS

Selection of websites

Three search engines were used to identify websites: Google, Yahoo, and Bing. Search engines were chosen based on their general popularity. Medical search engines are known to be nonsuperior compared with general search engines when it comes to sourcing health-related information for consumers.²⁶ The search on all 3 sites was conducted on April 25, 2017. Ten search terms—"bad breath," "halitosis," "oral malodor," "foul breath," "mouth malodor," "breath malodor," "feter ex ore," "feter oris," "ozostomia," and "stomatodysodia"—were used with each search engine. The top 50 consecutive websites using the 10 search terms from the 3 engines were selected, leading to an initial sample of 1500 websites. Only websites in English were included, although the search was not limited by file format or domain. Websites with denied direct access, duplicate websites, nonoperative sites, and sites containing irrelevant content, links to scientific articles or book reviews, and video feeds were excluded. A total of 101 websites were included in the final analysis. All websites were graded independently by 3 reviewers professionally trained in the same institution with at least 5 years of clinical experience in the diagnosis and treatment of halitosis. The reviewers were attuned to the

evaluation tools through an education session. All grading of websites was done within 4 weeks of the initial search.

Evaluation of type

Website categories were academic, commercial, news oriented, personal, physician/dentist, or non-profit. Academic websites were affiliated with a university, medical journal, or medical society. Commercial websites received industry funding, displayed advertisements, or included products for sale. News-oriented websites were non-medical sites with articles and anecdotal stories concerning the specified diagnosis. Personal websites were those operated by personnel such as physical trainers or therapists and layperson blogs. Physician/dentist websites included professional sites by individual physicians/dentists, as well as physician/dentist groups not affiliated with an academic institution. Sites categorized as non-profit were operated by government funding or donations only and included the National Institutes of Health (www.nih.gov) and Wikipedia (www.wikipedia.org).

The overall evaluation process is presented in Figure 1.

Evaluation of quality

The quality of the websites was then assessed using four quality assessment methods: Health on the Net (HON) score, the *Journal of American Medical Association* (JAMA) benchmarks, the DISCERN instrument, and Ensuring Quality Information for Patients (EQIP).

The HON criteria were designed to monitor transparency of information and purpose of the website to improve the quality of Internet-based health information.²⁷ Sites that comply with the listed standards may display the HON code seal, and they are subject to random audits for compliance. A 16-point scale was applied to include all key elements of the HON code and objectively evaluate the compliance of each site to the principles outlined by the HON code.²⁸ The evaluated categories include transparency and honesty, authority, privacy and personal data protection, updating of information, accountability, and accessibility. The presence of the HON seal was identified and recorded in each website.

The JAMA benchmarks have been used to assess basic information provided on websites since 1997 and consist of the following concepts: (1) authorship—provide proper identification of authors and contributors; (2) attribution—references and sources for all the contents to be clearly listed and noted; (3) disclosure—website ownership, financing, advertising, and conflicts of interest to be fully disclosed; and (4) currency—dated content is posted.¹⁴

The DISCERN instrument consists of 16 questions, with each question rated on a 5-point scale (1, poor to 5, good quality) according to the completeness of the health information provided. Questions 1-8 address the reliability of the publication and questions 9-15 address

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