



The Quality of Online Information Regarding Female Cancer Prevention: An Infodemiological Study.

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ABSTRACT

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Objective. This study aimed to evaluate the quality and content of information available online regarding the prevention and early detection of breast and cervical cancer in women.

Method. This cross-sectional infodemiological study was conducted in November 2022. Websites were identified using the Google search engine in incognito mode with specific keywords ("breast cancer prevention," "cervical cancer prevention," "early detection breast cancer" and "early detection cervical cancer"). The first 20 links from each search were included, totaling 80 sites, of which 43 comprised the final sample after exclusions for duplication, relevance, or loading failure. Overall quality was assessed using the Discern instrument (validated in Portuguese by Logullo et al., 2019), and content was analyzed based on official Brazilian guidelines (Ministry of Health, INCA). Evaluations were performed by three researchers, and scores were averaged.

Results. The overall quality of information was found to be moderate, with an average Discern score of 45.8. Governmental websites and PDF documents consistently showed higher quality, suggesting a more robust review process, whereas commercial websites received the lowest scores. Deficiencies were noted in addressing treatment risks, knowledge uncertainties, and support for shared decision-making. The disclosure of risk factors for both cancers was frequently absent or incomplete. Incorrect information was observed regarding mammography and cervical cancer screening ages, as well as HPV vaccination in immunosuppressed women. However, sites excelled at

encouraging medical consultation for suspicious changes and providing correct information on the cause of cervical cancer and the interval for cytopathological examination.

Conclusion. *The quality of online information on cancer prevention in women varies, with governmental websites proving more reliable. It is crucial to educate users on how to identify high-quality health information sources online to combat misinformation and empower women in cancer prevention and early detection.*

Introduction

The internet has become a prominent source of health information. Factors like ease of access, 24-hour availability, diverse information sources, and the ability to search privately encourage patients to use the internet (Ferreira et al., 2013; Heiman et al., 2018).

However, the quality of information available online varies (Joshi et al., 2020). Anyone can publish information online (Battineni et al., 2020), and the absence of peer-review parameters can facilitate the spread of false information (Joshi et al., 2020). Furthermore, this can misinform users, causing distress and inducing self-medication and self-diagnosis (Tan & Goonawardene, 2017). This issue arises because most patients don't know how to filter and select online information, and a lack of familiarity with certain medical terms can hinder content interpretation (Battineni et al., 2020).

Nevertheless, online information can help individuals prevent diseases and better manage health conditions (Chen & Peng, 2018). Similarly, cancer control actions promoted by the Ministry of Health aim to disseminate and expand access to quality information on cancer prevention and early detection (Brasil, 2022a; Brasil, 2020b). It's evident that assessing the quality of internet-available information is necessary, as correct information is essential for health promotion and can help patients manage diseases like cancer.

Considering the main types of cancers affecting women, with breast cancer having the highest incidence (Brasil, 2022c) and cervical cancer being the third most incident type (Brasil, 2022d), this study aims to evaluate the quality of information available on the internet regarding breast and cervical cancer prevention.

Methods

This was an infodemiological study. We identified websites using the Google search engine in November 2022. We used Google Chrome's incognito mode and cleared the browser cache to prevent previous searches from influencing the results (Dawson et al., 2020).

The keywords used were: "prevenção câncer de mama" (breast cancer prevention), "prevenção câncer do colo do

útero" (cervical cancer prevention), "detecção precoce câncer de mama" (early detection breast cancer), and "detecção precoce câncer do colo do útero" (early detection cervical cancer). We conducted a separate search for each keyword. For each search, we included the first twenty websites, consistent with the method employed by Joshi et al. (2020). This yielded a total of eighty websites.

The sample included websites that addressed prevention, screening, and/or early detection of breast cancer (BC) and cervical cancer (CC) and presented information in Portuguese. We excluded websites with duplicated Uniform Resource Locators (URLs), loading issues, or those discussing unrelated topics.

For each website included in the sample, we collected the following data: URL, title, publication year, and categorization by affiliation type (governmental, organizational, commercial, or database), format (web page or PDF document), text type (informative, government publication, interview, scientific article, news, or informational brochure), and cancer type (BC or CC). This information was organized in Google Sheets.

To assess website quality, we used the Discern instrument, developed by the University of Oxford and the British Library, and validated in Portuguese by Logullo et al. (2019). This tool analyzes the quality of health information and treatment options. It's a sixteen-question questionnaire divided into three sections. Section 1 comprises eight questions evaluating the reliability of the information and its source. Section 2, comprising nine questions, assesses the quality of information on treatment options. Section 3 is a single question evaluating the overall quality of the text (Logullo et al., 2019).

For each question, scores ranged from 1 to 5 points. A score of 1 indicates a complete absence of quality (Logullo et al., 2019), meaning the website entirely fails to meet the question's criterion (Charnock & Sheppeerd, s.d.). Scores from 2 to 4 demonstrate that the website partially meets the criterion, with 2 indicating partially low quality, 3 partial, and 4 partially high quality (Charnock & Sheppeerd, s.d.). A score of 5 signifies that the website fully met the question's requirement (Charnock & Sheppeerd, s.d.). The lowest possible Discern score for a website is 16, indicating a total

absence of information quality, and the highest is 80 (Logullo et al., 2019).

We evaluated the quality of website content based on the presence of information about the causes, risk factors, prevention, and early detection of BC and CC, drawing from reference literature in Brazil, specifically the National Cancer Institute's (INCA) Cancer Control Actions, the Brazilian Guidelines for Cervical Cancer Screening (Brasil, 2016), and the Guidelines for Early Detection of Breast Cancer (Brasil, 2015).

The collected content was organized into sentences; each rated on a scale from -1 to 2. A score of -1 was assigned when the website's information diverged from official documents. A score of 0 was given for information absent from the websites. A score of 1 was for incomplete information, and 2 for correct and complete information.

Sentences were categorized by cancer type (BC or CC). For BC content evaluation, we formulated 13 sentences, with a maximum possible score of 26 points and a minimum of -13 points. For CC, we formulated 16 sentences, with a

maximum possible score of 32 points and a minimum of -16 points.

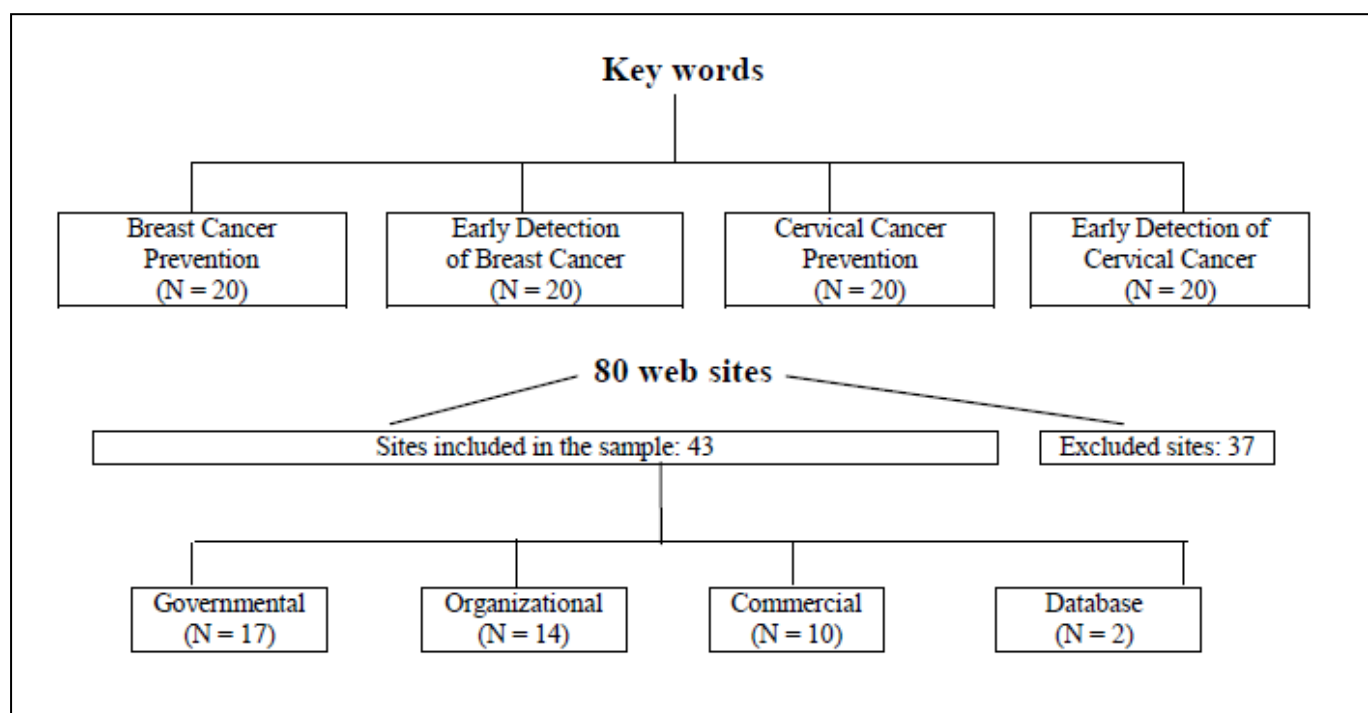
Each website was assessed using the Discern instrument and the corresponding reference document for each cancer type (content evaluation). Three researchers (JSA, BSG, and LSC) performed the website evaluation process to reduce judgment subjectivity. Scores from each evaluation were entered into Google Sheets, and the final score for each assertion was calculated as the average of the three evaluators' scores.

This study analyzed online information, characterized as public domain, and did not involve human subjects. Therefore, submission and approval by a Research Ethics Committee were not required.

Results

The initial search yielded 80 websites. Of these, 37 were excluded due to duplicate URLs (14 sites), not addressing breast or cervical cancer prevention, early detection, or screening (22 sites), or failing to load (1 site) (Figure 1).

Figure 1. Flowchart of the website search and exclusion process and their classifications.



Source: Author's own.

Of the 43 websites in the final sample, 22 addressed breast cancer and 21 covered cervical cancer. One website discussed both cancer types.

Based on institutional affiliation, the 43 websites were categorized as follows: governmental (17 sites),

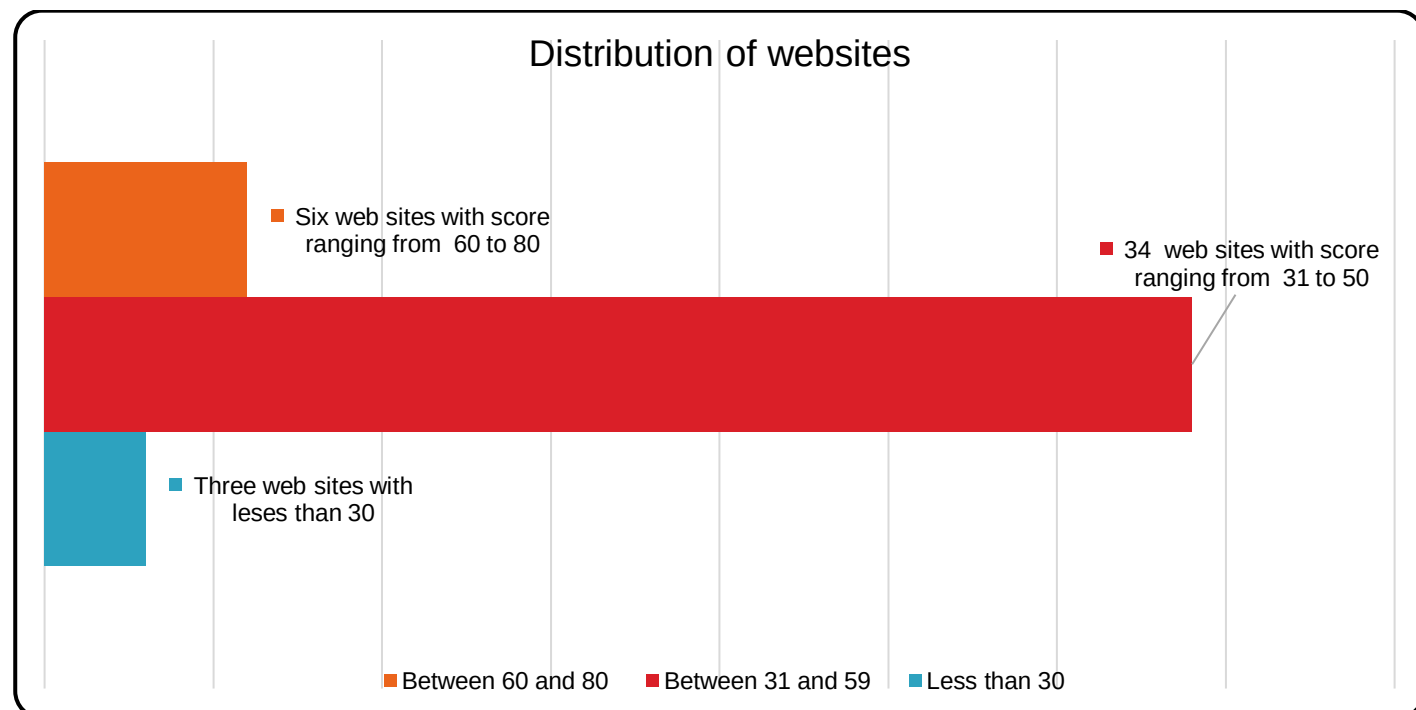
organizational (14 sites), commercial (10 sites), and database (2 sites). Websites were also classified by presentation format; 31 (72.1%) were web pages, and 12 (27.9%) were PDF documents.

Regarding the types of content found on the websites, there were 28 informative texts, eight governmental publications, two interviews, three scientific articles, one news item, and one informational brochure.

The overall mean Discern score for the 43 websites was 45.8.

The maximum score obtained was 74.7, and the minimum was 23.7. The distribution of websites by overall Discern score range is presented in Figure 2. The highest score (74.7) belonged to a governmental website addressing breast cancer, presented in PDF format, and classified as a governmental publication.

Figure 2. Distribution of the number of websites by Discern overall score range.



Source: Author's own.

Websites with an overall Discern score equal to or greater than 60 were considered high-scoring, as defined by Ng et al. (2021). Six websites (13.9%) achieved the highest scores, ranging from 63 to 74.7. These high-scoring sites were categorized as governmental or database affiliations. Most of these sites provided information on breast cancer (BC) and were in PDF format; however, one was a webpage. One site addressed both cancer types. Of these six top-scoring sites, four were governmental publications, one was a scientific article, and one was an informative text (Table 1).

Table 1. Scores achieved by websites according to Discern.

Website ID	Discern Score	Affiliation Type	Tex Format	Text Type	Cancer Type
12	74,7	Governmental	PDF	Governmental publication*	Breast cancer
13	66,3	Governmental	PDF	Governmental publication	Breast/ cervical cancer
11	66,0	Governmental	Governmental	Informative text	Breast cancer
18	63,7	Database	PDF	Scientific article	Breast cancer
5	63,0	Governmental	PDF	Governmental publication	Breast cancer
22	63,0	Governmental	PDF	Governmental publication	Breast cancer

* Governmental publications are considered official documents from federal, state, and municipal levels.

Source: Author's own.

The lowest Discern scores were observed in three websites (6.9% of the sample), ranging from 23.7 to 28.7, all categorized as commercial. The lowest score (23.7) came from a commercial website discussing cervical cancer (CC).

The other two low-scoring sites focused on breast cancer (BC). All three were web pages and presented informative content.

Regarding specific Discern aspects, the lowest scoring item

was treatment risks (question 11), where twenty-five websites (58.1%) scored less than two points. Other areas where sites frequently scored below two points included gaps in knowledge (question 8 [51.2%]), treatment effects on daily activities (question 13 [39.5%]), and support for shared decision-making (question 15 [37.2%]).

The Discern aspect that achieved the highest scores assessed whether the website provided the intended information (question 2), with nineteen sites (44.2%) scoring above four points in this regard. Beyond this, websites also scored above four points on questions concerning the presentation of the publication's aims (question 1 [27.9%]), the display of relevant information (question 3 [39.5%]), clarity in disclosing information sources (question 4 [30.2%]), disclosure of the information's publication date (question 5 [25.6%]), and the dissemination of other treatment options (question 14 [32.6%]).

Regarding the content evaluation for breast cancer (BC), the website achieving the highest score (21.7) was a governmental publication in PDF format. Conversely, the lowest score on this instrument (2 points) was observed in two websites. Both were classified as web pages and categorized as informative, though one was from an organizational source and the other commercial.

The BC content aspect that most diverged from official information was the non-performance of mammography in women aged 40-49 (item 10). Nine websites (40.9%) showed divergence on this point. Websites also presented discrepancies regarding the highest risk age group for BC (item 2 [22.7%]), age range and frequency for mammography (item 9 [27.3%]), and awareness about breast health as an early diagnosis strategy (item 11 [4.5%]).

A significant absence of information was noted in 18 websites (81.8%), which did not disclose the topic of environmental risk factors for BC (item 5). Other absent aspects on these websites included causes of BC (item 1 [59.1%]), endocrine/reproductive history risk factors (item 3 [59.1%]), genetic/hereditary risk factors (item 6 [54.5%]), genetic predisposition (item 7 [50%]), and early diagnosis through breast health awareness (item 11 [54.5%]).

Thirteen sites (59.1%) that covered BC described information on behavioral risk factors (item 4) incompletely. Other incomplete information on the sites included prevention measures (item 8 [50%]) and suspicious signs and symptoms (item 12 [50%]). One topic, item 13, was presented completely and correctly, with 12 sites (54.5%) adequately explaining that women should seek medical clarification if they detect suspicious changes in their breasts.

One website discussed both cancer types and was evaluated by both contents (for BC and CC), and received the note

66,3, thus, categorized how high punctuation.

Thus, 22 sites were analyzed by the CC content evaluation instrument.

In the analysis of cervical cancer (CC) information quality, the site that achieved the highest score, 20.7, was an organizational webpage with informative content. The site with the lowest score (0.7) was a commercial site, also with informative text.

Incorrect items concerning cervical cancer (CC) addressed the application of the HPV vaccine in immunosuppressed women, the age range for cervical cytology examination, and the absence of risk of developing CC in women who have never had sexual activity. These inaccuracies were presented in items 11, 14, and 15, respectively, with each item showing divergence in 9.1% of the sites. One site (4.5%) incorrectly presented information regarding the target age group and number of HPV vaccine doses (item 10).

Items 11 and 15 were also among the absent topics in sites discussing CC, in addition to item 16, which covers the interval for cervical cytology examination in immunosuppressed women. Information on each of these three items was absent in 86.4% of the sites.

Other absent information on CC-related websites included factors for cancer development beyond HPV infection (item 4 [68.2%]), spontaneous regression of HPV infections in women under 30 years old (item 6 [68.2%]), partial protection against HPV contagion by condoms (item 8 [63.6%]), and performance of cervical cytology examination in vaccinated women (item 12 [63.6%]).

Incomplete topics on the websites concerned risk factors for CC (item 5) and the interval for cervical cytology examination (item 13). For each of these items, nine websites (40.9%) presented partial information. The correct and complete aspects found on the sites were items 1 and 13, which provided accurate and comprehensive information on the cause of CC and the interval for cervical cytology examination, respectively. Each of these pieces of information was correct and complete on six sites (27.3%).

Discussion

In this study, we evaluated the quality and content of 43 websites. The average Discern score for these sites was 45.8, indicating that most of them provided medium-quality information.

Governmental websites addressing breast cancer (BC) showed higher quality when assessed by Discern. This finding might be explained by the publication of national Guidelines for Early Detection of Breast Cancer (Brasil, 2015), which could standardize actions and, consequently, reduce health inequalities (Ewington et al., 2022).

Furthermore, this result suggests governmental interest in publishing high-quality information on BC prevention and early detection, likely due to the high incidence of BC in the country (Brasil, 2022c). Well-informed patients can thus contribute to BC prevention and early detection (Chen & Peng, 2018), leading to reduced mortality.

Of the six websites with the highest Discern scores, five were in PDF format, classified as governmental publications and scientific articles. This suggests a prior review process for PDF publications, including details such as authors, publication date, references, and disclosure of benefits and risks of treatment options.

Conversely, commercial websites consistently showed the lowest scores in both the Discern evaluation and content assessment. In these cases, commercial interests might have compromised the veracity and quality of information provided to users (Ferreira et al., 2013). It is crucial to note the absence of regulations or oversight on information published through such channels (Ewington et al., 2022).

The majority of websites failed to adequately present information regarding the risks of each treatment (Discern question 11). This aligns with other research indicating that websites often highlight treatment benefits while minimizing or omitting potential risks (Burke et al., 2020).

Websites also scored poorly on questions assessing the disclosure of information with uncertainty (Discern question 8), treatment effects on quality of life (Discern question 13), and offering support for shared decision-making (Discern question 15). Questions 11, 13, and 15 comprise Section 2 of Discern, which evaluates the quality of information on treatment options. The lack of evidence validating therapies and the failure to present the risks and implications of treatment options may indicate low-quality information on these sites (Ng & Gilotra, 2021).

Conversely, sites scored better on questions in Discern's Section 1, which addresses the reliability of information and its source. It was also observed that sites scored well on question 14 of Section 2, which addresses the promotion of different treatment options. This might suggest that while they presented various alternatives, they were insufficient in detailing their specifics, risks, and impacts.

In the content evaluation, the disclosure of risk factors for both cancer types was either absent or incomplete. Primary cancer prevention actions include reducing or avoiding exposure to risk factors (Brasil, 2020). Thus, a notable primary prevention strategy is the dissemination of cervical cancer (CC) risk factors, which can contribute to reducing CC cases in the country (Brasil, 2020).

Despite the Brazilian Guidelines for Early Detection of

Breast Cancer not recommending breast self-examination as a screening method (Brasil, 2015), some websites still presented this information. A previous study similarly observed that websites, in addition to mammography, listed breast self-examination and clinical breast examination as screening methods, though the information was generally incorrect (Ferreira et al., 2013). Furthermore, sites indicated a younger age for mammography than recommended, failing to present the risks associated with early examination. The discussion of potential overdiagnosis and false-positive or false-negative results from screening examinations was also poorly addressed on websites evaluated in another study (Ferreira et al., 2013).

The recommended age for CC screening was also incorrect on several websites. Some indicated the onset of sexual activity as the initial screening benchmark. Disseminating the incorrect age range discourages screening among women who should be screened (Ferreira et al., 2022). Moreover, it promotes examinations in younger women (Ferreira et al., 2022), despite CC incidence being low and screening less effective before age 24 (Brasil, 2016).

Encouragingly, websites correctly and completely disseminated information advising women to seek medical clarification if they detect suspicious changes in their breasts (Brasil, 2015). The cause of CC and the interval for cervical cytology examination were also adequately disclosed by the websites. Despite discrepancies regarding the recommended age for CC screening, the interval for the examination was correctly provided.

This study found that websites correctly indicated persistent HPV infection as the cause of CC, which could promote HPV vaccination efforts. However, another study noted the online dissemination of false information about vaccines (Suarez-Lledo & Alvarez-Galvez, 2021). Such contradictions can undermine public consensus on the efficacy and safety of known vaccines, including the HPV vaccine (Suarez-Lledo & Alvarez-Galvez, 2021).

The internet fosters shared decision-making between doctors and patients (Burke et al., 2020), as patients use online information to prepare for appointments and better understand what is discussed with them (Tan & Goonawardene, 2017). Consequently, disseminating quality and easily understandable information enhances patient knowledge and promotes greater patient involvement in the decision-making process (Hyatt et al., 2022).

Google is the most used search engine by Brazilian users (Similarweb, 2022). However, the first search results do not necessarily indicate a higher level of quality (Dawson et al., 2020). Therefore, users must be educated on how to find and select quality online information to empower them regarding

the information they access (Joshi et al., 2020). Patients should also be warned that not all online information is correct or of high quality. Educating patients on cancer prevention and screening can help combat the spread of misinformation (Conley et al., 2021).

Limitations

The limitations of this study include the use of only one search engine and the evaluation of only the first 20 links from each search, which may have affected the sample size. It was not possible to calculate correlations between website origin and information accuracy. Furthermore, the evaluation of information on breast and cervical cancer prevention and early detection on the websites was performed by researchers and not by specialists in the field, relying on information available in official documents and websites. User perception regarding the legibility of the available information, which might differ from the findings of this study, was also not analyzed. Finally, the study was cross-sectional, not allowing for the monitoring of changes in information quality over time.

Conclusion

This study assessed the quality of online information regarding cancer prevention in women, utilizing the Discern questionnaire and content analysis. Our findings indicate that the overall quality of information is moderate, with an average Discern score of 45.8 for the 43 websites analyzed.

We observed that governmental websites presented higher quality information on breast cancer, suggesting that national guidelines might contribute to a higher standard of content. Most of the top-scoring websites were PDF documents, frequently classified as governmental publications or scientific articles, which may indicate a more rigorous review process. In contrast, commercial websites displayed the lowest scores in quality and content evaluations, raising concerns about the veracity and regulation of information on these channels.

Regarding specific quality aspects, websites failed to adequately address treatment risks, knowledge uncertainties, treatment effects on quality of life, and support for shared decision-making. However, they performed better in terms of information and source reliability.

In the content evaluation, the disclosure of risk factors for both breast and cervical cancer was frequently absent or incomplete. Incorrect information was identified concerning the age for mammography and cervical cancer screening, as well as the application of the HPV vaccine in immunosuppressed women. Despite these gaps, websites provided correct and complete information on the need to seek medical guidance for suspicious changes in breasts, the cause of cervical cancer, and the correct interval for

cytopathological examination.

These results underscore the importance of critically evaluating online health information and highlight the necessity of reliable sources to empower women in cancer prevention and early detection.

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