Assessing the Quality and Readability of COVID-19 Health Information : A Cross-sectional Analysis

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Abstract

Background: The COVID-19 pandemic has led to an unprecedented surge in online information concerning disease transmission and symptoms.

Objective: This study aims to systematically evaluate the quality and readability of articles resulting from commonly searched COVID-19 terms on Google .

Methods: Using Google Trends, we identified the 25 most frequently searched health-related phrases. The first 30 search results for each term were collected, and articles were assessed using the Quality Evaluation Scoring Tool (QUEST). Three

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raters evaluated each article on criteria including authorship, attribution, conflict of interest, currency, complementarity, and tone. Additionally, a readability analysis was conducted.

Results: A total of 709 articles were screened, with 195 meeting inclusion criteria. The mean article score on QUEST was 18.4 (SD 2.6) out of 28, with only 7% (14/189) scoring in the top quartile. National news outlets accounted for the largest share (70/189, 36%) of articles. Peer-reviewed journals achieved the highest average QUEST score compared to national/regional news outlets, national/state government sites, and global health organizations (all P<.05). The average reading level was 11.7 (SD 1.9, range 5.4-16.9), with only 3 (1.6%) articles written at the recommended sixth-grade level.

Conclusions: COVID-19-related articles exhibit significant variability in their attributes and levels of bias, highlighting the need for enhanced readability revisions.

KEYWORDS COVID-19; COVID-19 pandemic; health literacy; readability; QUEST; online health information; cross-sectional; trend; internet; transmission; symptom; quality;

Introduction

Since the onset of the COVID-19 pandemic, there has been a continual influx of new information regarding disease transmission, symptoms, and the associated health and economic ramifications. This rapid dissemination often results in contradictory reports emerging within a short span. For instance, discussions on the efficacy of hydroxychloroquine in treating COVID-19 were prevalent early in the pandemic, with some sources claiming significant benefit. However, subsequent peer-reviewed studies have refuted these claims. The prevalence of conflicting information

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highlights the crucial need for standardized quality control of online health information, especially amid ongoing vaccination and public health campaigns. (Association of American Physicians and Surgeons, 2020)

The fragmented public health response, partly due to conflicting information, has compounded confusion among the general population. For example, the importance of universal masking in preventing disease transmission was initially unclear. Such conflicting messages likely left many consumers feeling uncertain about which sources to trust, leading to information overload and heightened anxiety, particularly with the widespread use of social media. Moreover, previous analyses of online health information have revealed generally low quality. Given this prevalence of subpar information and the influx of contradictory data, there is a compelling need to analyze the information being consumed by the public. (Boulware et al., 2020)

To address this need, we utilized Google Trends (GT) to identify popular COVID-19 search terms and curated a list of associated online health articles. Subsequently, we employed the Quality Evaluation Scoring Tool (QUEST) to assess the validity of these articles. QUEST provides a quantifiable metric to evaluate online health information, assessing aspects such as authorship, attribution, conflict of interest, currency, complementarity, and tone. High-quality articles, according to QUEST, are deemed trustworthy, credible, and exhibit an appropriate tone for the reader. We chose QUEST for its clear scoring guidelines and its similarity to the US National Library of Medicine's "Medline Plus Guide" in assessing online health material. (Skipper et al., 2020)

In addition to systematically evaluating article quality using QUEST, we aimed to gauge the readability of articles resulting from the most frequently Google-searched health-related COVID-19 terms . Given the varying literacy levels within the public,

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a readability analysis was performed on each article to compare against the recommended sixth-grade reading level for patient health communication materials. While the accuracy of health information production is crucial, it is equally vital for this information to be presented in an understandable manner. We hypothesized that the reading levels of commonly searched health phrases would exceed the comprehension level of the average American, and that the public was consuming low-quality online information regarding COVID-19. (Farooq et al., 2020)

Methods

Article Selection

Institutional review board approval was not sought for this study as all information analyzed was freely available online. For the purpose of this investigation, an "article" was defined as any published written content, excluding personal blogs, editorials, and commentaries.

Google Trends (GT) was utilized to identify the most popular queries searched by the public, offering crucial insights into emerging trends. Previous studies have validated the use of GT for monitoring COVID-19 incidence and public attention, particularly in regions with limited diagnostic capabilities. To mitigate location bias, online articles were gathered using a location-disabled ." "Health," and "Web search." February 29, 2020, was selected as the start date, coinciding with the first reported COVID-19-related death by the Centers for Disease Control and Prevention (CDC) and marking a notable surge in Google searches for "coronavirus."

The top five search queries with the highest search frequency were identified: "coronavirus," "corona," "corona virus," "symptoms," and "coronavirus update."

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Subsequently, each of these terms was searched on GT using the established methodology. Additional related search queries (including the original term) were collected, resulting in a total of 25 unique health-related search phrases.

Between April 30 and May 2, 2020, each keyword phrase was searched, and all articles containing more than 100 words from the first three pages of the Google search results were collected. This approach yielded approximately 10 articles per page. Previous research indicates that internet users typically do not navigate beyond the first three pages of Google search results. In cases where articles overlapped across multiple queries, duplicate articles were excluded from analysis. For each collected article, data on the Google page number, order on the page, article link, website name, website category, article title, author, publication date, and number of references were recorded.

QUEST Scoring

Three independent authors individually scored all articles using each of the 7 QUEST questions and their associated point values. Each article's scores for individual sections were then aggregated into a total score ranging from 0 to 28, where 28 represented the highest quality article possible. The final score for each article was calculated as the average of the three independent scorers' analyses. Interrater consensus was assessed using Fleiss's kappa metric.

Statistical Analysis Statistical analysis and figure generation were performed using Microsoft Excel. Descriptive statistics including mean, median, etc., were calculated. We introduced a novel metric termed "search order product" to investigate potential differences in quality between articles appearing earlier versus later in search results. The search order product was calculated by multiplying the page number on Google by the order of the article on that page. Comparative t-tests

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and Pearson correlation analyses were conducted to stratify scores by variables. To adjust for multiplicity, the Benjamini-Hochberg false detection rate correction was applied to P values.

Readability Analysis Readability analysis was conducted using Readability Studio Professional Edition Version 2015 (Oleander Software, Ltd), employing nine validated formulas to assess article readability. These included the Coleman-Liau Index, Flesch-Kincaid Grade Level, FORCAST formula, Fry graph, Gunning Fog Index, New Dale-Chall, New Fog Count, Raygor Reading Estimate, and SMOG (Simple Measure of Gobbledygook). To minimize bias, we calculated the reading level for each article by averaging estimates derived from all nine scales. These estimates were then compared to the American Medical Association-recommended reading level of sixth grade for health education materials. Additionally, the Flesch Reading Ease (FRE) formula was applied separately to assess reading level on a different scale, with FRE scores categorized into various readability levels ranging from very difficult to very easy.

Results

QUEST Analysis

A total of 709 Google results listings were initially examined. After exclusion criteria were applied, 195 individual articles were scored using QUEST.

The mean article score was 18.4 (SD 2.6) out of 28, with only 7% of articles in the top score quartile and 89% in the top half of scores. National news outlets published the largest share of analyzed articles (36%), followed by private health-focused entities (23%) and regional news outlets (15%). Global health organization sites had the lowest average score (mean 17.2, SD 1.2), while peer-reviewed journals had the

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highest average QUEST score (mean 22.7, SD 3.18), significantly higher than other sources.

Entertainment and cultural outlets also had significantly higher quality scores compared to regional news outlets and state government sites.

Analysis of QUEST scores by search order product showed no significant trends, indicating no hierarchy by listing order.

There was a significant positive correlation between the number of references in an article and the QUEST diagnostic score.

Readability Analysis Readability levels for 187 of 195 articles were collected. The average reading level across all 187 articles was 11.7 (SD 1.9), ranging from fifth-grade to undergraduate senior reading levels.

There was variability among readability scales, with New Fog Count scoring the lowest mean readability and Fry scoring the highest.

Flesch Reading Ease scores corresponded to difficult reading levels, averaging 47.2, indicative of college-level reading.

Only 1.6% of articles were written at the recommended sixth-grade level, while 23.5% were written beyond high school level.

Discussion

Analysis of Results

This study systematically assessed and determined that articles resulting from the most frequently Google-searched health-related COVID-19 terms were of higher quality and readability than hypothesized. The QUEST scoring tool proved to be effective in synthesizing aggregate data regarding various aspects of literature,

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including authorship, attribution, conflict of interest, currency, complementarity, and tone. Despite the prevalent misinformation on the internet, the analysis of our dataset revealed that 89% of articles scored in the upper quartiles, suggesting that online information regarding COVID-19 in the United States was of higher quality than anticipated. (Cuan-Baltazar et al., 2020)

With the increase in news dissemination by national media after the onset of the pandemic, national news outlets unsurprisingly emerged as the largest source in our sample set, followed by private health-focused entities. Notably, there was less output from global organizations such as the World Health Organization and United Nations, contradicting their organizational goals of extensive public health campaigns and initiatives. This discrepancy may be attributed to organizational choices to frequently update centralized information pages rather than generating new articles. (Robillard et al., 2018)

The lack of significant trends associated with increasing search order product values implied a qualitatively homogenous sampling of articles by exposure in our analysis, validating the decision to analyze only the first three pages of each term's Google search. Stratification of the QUEST scores by article categorization revealed source-based qualitative differences, with peer-reviewed journals exhibiting the highest average score, likely due to their rigorous scientific vetting process prior to publication. (Ortiz-Martínez et al., 2020)

The majority of articles were written well above the recommended reading levels, indicating that COVID-19 articles may be too difficult for the average American to comprehend. Results from the readability analysis substantiated our hypothesis and highlighted the importance of ensuring that health information is presented in an understandable manner to reach broader audiences effectively. (Hu et al., 2020)

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Moving forward, publishing sources may benefit from allocating resources to optimize the communication of health information. Strategies outlined in resources such as the Health Literacy Universal Precautions Toolkit (HLUPT) could be employed to enhance patient understanding and improve the readability of written materials. Subjecting patient-facing articles to rigorous quality and literacy guidelines will aid in improving both publishing standards and consumer understanding, essential for effectively communicating vital information. (Basch et al., 2020)

Conclusion

The COVID-19 pandemic in the United States brought about a surge of online health information. In this study, we investigated the need for quality control of this information by assessing articles resulting from the most-searched health-related terms in the United States using the QUEST rubric and readability software. Despite the prevalence and transmission of misinformation during the pandemic, the most frequently searched Google articles exhibited good information quality. However, the majority of these articles were written above the recommended reading level for the public, diminishing their effectiveness in countering the spread of misinformation.

Limitations

Several limitations should be considered when interpreting the findings of this study. These include the small sample size, reliance on only three raters, and the lack of individual comparative analysis when determining search keywords. Additionally, while Google Trends was utilized to identify popular keywords, the exclusion of multi-word keywords without quotations may have introduced bias in listing order.

Google's updated quality rating guidelines may also have influenced the results by filtering out certain content.

Furthermore, the use of only the QUEST scale to measure article validity may overlook other evaluation tools that could provide differing or complementary insights. The slight agreement between raters, as indicated by the Fleiss's kappa value, suggests the subjective nature of the QUEST rubric, particularly in areas such as attribution, tone, and conflict of interest. However, despite variations in absolute scores, there was consistency in relative rankings among raters.

Additionally, facets of the QUEST scale, such as authorship and currency, may allocate points for characteristics that do not directly correlate with information accuracy, potentially impacting the scores of government and global health organizations. Future studies on misinformation, particularly in the context of the COVID-19 pandemic, would benefit from examining media beyond articles, such as radio, social media, and television, to gain a more comprehensive understanding of its spread.

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