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Assessing the Quality of COVID-19 Messages on Ahvaz Jundishapur University of Medical Sciences Website: A Content Analysis

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Abstract:

Aims: This study aimed to assess the quality of public messages related to COVID-19 available on the Website of Ahvaz Jundishapur University of Medical Sciences (AJUMS).

Background: Accurate and reliable health information is critical in the community, especially when facing global health crises. Medical universities play a key role in providing this information to the general public and the quality of information is expected to be favorable.

Objective: The study aims to conduct a content analysis to evaluate the quality of COVID-19 messages published by AJUMS, focusing on several key criteria including message content type, scientific ability and accuracy of messages, fluency and simplicity of messages, the appearance of content design, and being based on scientific evidence.

Methods: In this descriptive study, 20 news messages were produced on the main website of Ahvaz University of Medical Sciences (WEBDA). Faculties and sub-units were randomly selected and evaluated with the help of a researcher-made checklist. Data analysis was performed using SPSS25 software, as well as Fleiss' Kappa coefficient and descriptive statistics methods.

Results: Of the messages, 73.4% (80/109) were concerned with the prevention, and 34.9% (38/109) were concerned with the management and control of COVID-19. Total 89% (97/109) of messages were targeted at the public, while 14.7% (16/109) were addressed to people in contact with the patient. About 42% (46/109) of the content of messages was related to social distancing, 38.5% (42/109) to hand hygiene, and 16.5% (18/109) to vaccination. About 92.7% (101/109) of messages did not mention any specific group. In terms of message approach, 45% (49/109) of messages had a news tone; 23% (26/109) had a persuasive tone; and 9.2% (10/109) had a threatening tone. Also, the most and least attention of the messages was on physical health (46.8% (51/109)) and spiritual health (2.8% (3/109)), respectively.

Conclusion: To effectively educate the public on health issues, decision-makers should employ experts in message design to provide reliable content. This ensures the target audience receives accurate, information to improve their health and well-being, as most current messages lack scientific strength, fluency, simplicity, and appealing design.

Keywords: Content analysis, Text message, COVID-19, Coronavirus, Iran, Scientific strength.

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1. INTRODUCTION

The COVID-19 pandemic originated in Wuhan, China, in 2019 and quickly became a global health crisis [1-4]. Concurrently, advancements in technology have led to the development of new tools for detecting and preventing COVID-19. For instance, a study has examined innovative methods for identifying adherence to health protocols during multi-person interactions [5], while other research has focused on introducing new techniques to enhance the quality of CT images in COVID-19 patients [6, 7]. The dissemination of these findings to the public is facilitated by news media. This situation has impacted all aspects of daily life [4, 8-10] and increased media consumption as people seek reliable information to protect themselves from the virus [11]. Therefore, the news media played a critical role in shaping people's perceptions and reactions to the outbreak [12]. In this regard, a study by Vatsa *et al*. examining the impact of media on public perception and behavior in dealing with the Omicron variant showed that media can influence people's health attitudes and behaviors [13].

The media provided a lot of new, up-to-date, and contradicting information about different aspects of the COVID-19 disease, leading to a heterogeneous public health response [12, 14]. Reliable information is critical to motivate people to take appropriate action against the virus, promote science-based public health guidelines, and prevent the spread of false information [15]. Around 75-80% of Internet users worldwide actively search for health information online [16].

A study in the Journal of Medical Internet Research found that 2% of websites are devoted exclusively to health topics, underscoring the importance of reliable sources of information. More than 70,000 websites publish health-related information, and surveys show that most internet users rely on online resources for health information [17, 18]. In other words, virtual space plays a crucial role in our social lives and in our efforts to stay healthy [19].

Due to inadequate health systems, authorities have taken measures such as school closures, remote work, and social distancing regulations to combat COVID-19 [20]. Under such dire conditions, the public has been looking for trusted information and guidance based on scientific evidence to respond to the outbreak and slow the spread of the virus in these difficult times [21].

The COVID-19 pandemic has led to more people accessing free health information online [22]. However, it is important to evaluate the reliability and accuracy of online sources because misinformation can have serious consequences. Online sources can be valuable for learning about the pandemic, but it is critical to rely on reputable sources and critically evaluate the information received. The Internet has become one of the most important sources of health information due to its widespread distribution and use [20, 21, 23].

Although the Internet offers a wealth of health information, it is important to know that not all of it is trustworthy. Some online sources can help individuals stay healthy and manage the disease, but their reliability and accuracy are debatable [23].

Local media play a critical role in informing the public about health issues. However, they must adapt to changing media trends and provide an effective content structure that meets the changing needs of society [24]. In this way, they can fulfill their civic responsibility by providing valuable information to their communities. However, a recent study has shown that the language factor is often overlooked in the design of health messages [25]. The language used in health messages can significantly influence their effectiveness in promoting healthy behaviors and preventing the spread of COVID-19.

Media literacy is critical in today's digital age, and educators should incorporate it into educational programs to help students develop the skills necessary to create and evaluate effective media messages, including those related to health [24]. In Iran, since the COVID-19 outbreak, medical universities have provided a wealth of health information by playing a role in disseminating accurate and reliable information about COVID-19 to the public, including students, medical professionals, and the general population. The role of the media in shaping public opinion and influencing individuals' thoughts and feelings about health-related issues is crucial in our interconnected world. Quality media can lead us to meaningful conversations that benefit everyone. Therefore, it is critical to evaluate the quality of health-focused news media for accuracy, impartiality, and, relevance. It is important to analyze and critique the news we produce not only to ensure its current accuracy and effectiveness but also to learn how we acquire and use knowledge in the future.

The quality of online health information content is critical due to the varying accuracy levels of sources. Users may make uninformed decisions without a reliable method to assess their accuracy and credibility. Standardized tools like the CRAAP Test [26], AIMQ Methodology [27], information quality tool [IQT], and quality scale [QS] [28] offer significant advantages in evaluating the quality of online health information. These methods allow users to systematically assess the credibility, relevance, accuracy, timeliness, and purpose of information using a scientific approach. For instance, the CRAAP Test evaluates criteria related to the currency, relevance, authority, accuracy, and purpose of information, which can lead to more informed decision-making. Similarly, the AIMQ methodology focuses on assessing the quality of health information, helping users identify credible sources, and preventing the spread of inaccurate information. These tools not only improve the quality of health information but also contribute to enhancing media and health literacy. The choice of tool depends on the context and specific requirements of the evaluation process. Therefore, considering the prevalence of misinformation, contradictory, and non-standard information regarding COVID-19, this study assessed the quality of health messages published on the website of

AJUMS. This research aimed to ensure the accuracy and credibility of the information provided to the community, assisting physicians, health professionals, and decision-makers in improving the quality of health-related information disseminated to the public, thereby enhancing public health education. Additionally, the results of this research could lead to improved communication strategies in public health and increased public awareness through reliable informational resources.

2. MATERIALS AND METHODS

2.1. Study Design

The study analyzed how COVID-19 was covered on the AJUMS website using descriptive epidemiology and content analysis. The aim of the study, conducted from December 2019 to May 2020, was to assess the accuracy and quality of news messages regarding the pandemic.

2.2. Participants and Sample Size

This study focused on analyzing news messages on the main website of AJUMS and its affiliated faculties; health departments; health and treatment networks covered by the university; and Health centers of West and East Ahvaz cities (Appendix **1**). To collect the necessary information, the researchers reviewed relevant websites and created a curated archive of news stories about COVID-19. They selected and categorized these news stories based on their accuracy, completeness, tone, style, and use of graphics and visual elements. The archive contained 100 news stories, of which the researchers randomly selected 20 for review and analysis. The links to the news messages were numbered in the archive, and to provide evaluators with access to the content of the messages, the links were sent to them. The archive's message system, facilitated easy referencing and retrieval of specific messages, also providing users with convenient access to desired messages with a single click.

The criteria for selecting messages were: All the news messages that were uploaded on the above websites between December 2019 and May 2020. This period was chosen because it coincided with increased public interest in news related to COVID-19, particularly online messages. Additionally, the inclusion criteria for evaluators of news messages were: graduate in the field of health education and health promotion and educational technology; along with proven experience in creating, designing, and evaluating health media. The exclusion criteria included: Educational messages that were not news and messages produced outside the specified time frame were excluded from the study.

2.3. Data Collection

In this study, researchers created a checklist as a data collection tool to assess the quality of news about COVID-19. The checklist analyzed several factors, including media and news characteristics, having/not having an archive on the website, type of content, scientific integrity, accuracy, clarity, simplicity, and appearance of content design. This state-of-the-art approach provides a comprehensive assessment of news quality on the website and offers valuable insights into how information was shared during the study period.

To ensure a thorough evaluation of the messages, the researchers enlisted the help of six health education and promotion and educational technology professionals with proven experience in creating, designing, and evaluating health media. A questionnaire with specific questions about each message was designed on the Google platform and visually enhanced with appropriate images. Using the Google platform has several advantages, including ease of distribution, real-time data collection and analysis, and location-independent accessibility *via* a link shared *via* WhatsApp.

Before sending the message links to the evaluators, they were asked to provide their written consent to participate in the study and complete the questionnaire related to each of the 20 selected messages, with a daily limit of one message. This measure was taken to ensure timely and accurate responses. This methodology may contribute to the validity and reliability of the study results.

2.4. Measurement Tools

The checklist contained eight different segments that allowed for a more organized and structured data collection process that was easier to analyze and interpret.

The first part of the checklist included five questions regarding the demographic profile of the media evaluators/experts. These questions addressed age, gender, educational background, work experience, and previous involvement in creating, designing, or evaluating health-related educational media (Appendix **2**).

The second part of the checklist consisted of two questions aimed at identifying the characteristics of the message. The first question asked the rater to note the number of the message, while the second question asked the rater to select the name of the website from which the message originated among the available options.

The third part of the checklist consisted of two questions about the news messages archive. The first question inquired whether there was an archive of messages related to Corona on the website/blog under review, and respondents could indicate their answer with a 1 for yes or a 0 for no. The second question required them to select an option from a list related to how to configure the archive.

The fourth part of the checklist consisted of 9 questions aimed at evaluating the nature of the message content. Six questions were multiple-choice. The other three questions were rated on a 3-point Likert scale from 0 to 2 for each question. The options for each question were "No=0; somewhat=1; Yes=2 and Not applicable =0".

The fifth part of the checklist consisted of four questions about documentation and scientific evidence. Raters were asked to identify the sources of information used in the message, the level of detail, and the scientific terminology used.

The sixth part of the checklist consisted of two questions on the scientific ability and accuracy of the messages. The seventh segment included six questions on message fluency and simplicity, while the eighth segment consisted of five questions on visual presentation and appearance of content design. These questions were rated on a three-point Likert scale that ranged from 0 to 2 for each question, with options of no=0, somewhat=1, and yes=2. Some questions in these segments used a four-point Likert scale ranging from 0 to 2, with options of no/ not applicable (0), somewhat (1), and yes (2).

2.5. Validity and Reliability of the Questionnaire

The initial questions of the questionnaire were developed after a careful consideration of research variables, analysis of relevant texts, and consultation with experts. The questions took into account existing criticisms of the content of the message and adhered to standard principles for educational materials. The validity of the instrument was assessed using two methods: face and content validity [29]. To ensure the face validity of the tool, the researchers conducted face-to-face interviews and group discussions with a panel of eight health education and promotion and educational technology experts. Their opinions regarding the level of difficulty, the degree of inappropriateness, the ambiguity of phrases, or the existence of deficiencies in the meanings of the questionnaire items were applied.

In the qualitative assessment of content validity, the questionnaire was distributed to eight specialists—two from the field of educational technology and six from health education and promotion. They were asked to carefully review the instrument and provide written corrective feedback for each item. After collecting their comments, the necessary revisions were made to the instrument.

The researchers conducted a quantitative evaluation of content validity using two methods: Content Validity Ratio [CVR] and Content Validity Index [CVI]. Based on feedback from eight experts, the questionnaire had an overall CVR value of 0.92, indicating good content validity [30, 31]. Each segment of the questionnaire also had substantial CVR values, with message specification having a CVR value of 0.97, message archive having a CVR value of 0.96, content type having a CVR value of 0.88, scientific documentation and evidence having a CVR value of 0.87, scientific strength and accuracy having a CVR value of 0.92, message fluency and simplicity having a CVR value of 0.95, and appearance of content design having a CVR value of 0.94.

When calculating the CVR, the researchers used the CVR formula and fitted the responses to Lawshe's table. This provided a standardized approach to determining content validity [32]. Additionally, the CVI score for each section of the questionnaire was calculated by averaging the questions in that section. This provided a reliable measure of content validity for each section.

The overall CVI value of the questionnaire was 0.91, indicating good content validity. Each segment of the questionnaire also had notable CVI values, with message specification having a CVI value of 0.93, message archive having a CVI value of 0.98, content type having a CVI value of 0.91, scientific documentation and evidence having a CVI value of 0.86, scientific strength and accuracy having a CVI value of 0.93, message fluency and simplicity having a CVI value of 0.92, and appearance of content having a CVI value of 0.89. The CVI is a reliable measure of the content validity of each section of the questionnaire.

2.6. Statistical Analysis

To analyze the data, the researchers used several descriptive statistical techniques. These included categorizing the data by percentage distribution, calculating averages, and creating tables and graphs. These techniques provided a comprehensive overview of the results and facilitated easy interpretation and visualization of the data.

Researchers used Fleiss' Kappa as a statistical measure to assess the reliability of multiple raters or observers in categorical data analysis. This measure helps determine the level of agreement or reliability among the raters, which is essential for achieving consistent and accurate evaluations. The importance of this issue becomes particularly evident in situations where several raters are involved in assessing the quality of information.

By calculating Fleiss' kappa, decision-makers can assess the consistency of evaluations obtained from different raters or observers, identifying discrepancies or inconsistencies that may require further clarification or training. Fleiss' kappa provides a standardized and quantitative measure of agreement, making it easier to compare and interpret results. Data were analyzed using SPSS25 software.

2.7. Challenges and Difficulties of the Study

The main challenges of this study were as follows:

2.7.1. Lack of Message Archives

Most of the websites examined did not have message archives, making access to information difficult.

2.7.2. Time Consuming Evaluation Process

Each specialist had to complete all the questions in the questionnaire for evaluating each message, which was time-consuming and led many specialists to be reluctant to participate as evaluators.

2.7.ᴴ Difficult Interpretation of Results

Since no similar study had been conducted using this questionnaire before, interpreting the obtained results was challenging.

2.7.4. Content Analysis of Messages

Analyzing the content and determining the appropriate categorization for each message, especially in cases where messages had different tones [such as threatening or persuasive], proved to be challenging.

3. RESULT

The percentage distribution of responses to the questionnaire items is shown in Table **1**. Also, other results show that all media evaluators have experience in creating, producing, and analyzing health media. One member has a master's degree, and five others were faculty members with doctorates in health education and promotion and health promotion and educational technology.

Table 1. The view of experts regarding the rate of responses to the content of the news messages items by closed-ended questions at the AJUMS website in 2020 (n=109).

| -	Content of the Message	Yes	No	Somewhat	Not Applicable
1	Disrespectful	32.1	58.7	0.9	7.3
2	Refer to threats or benefits	22	38.5	39.4	-
3	Credibility	78	0.8	20.2	1
4	Up-to-date and reliable scientific sources (latest guidelines)	31.2	1	49.5	18.3
5	Inconsistency with other media content	9.2	69.7	11.9	9.2
6	Coherence and consistency	77.1	1.8	21.1	-
7	Containing additional information	14.7	61.5	23.8	-
8	Using relevant technical terms related to the topic	18.3	69.7	11.9	-
9	Accuracy in wording and phrasing	60.6	1.8	37.6	-
10	Clarity and simplicity	30.3	-	69.7	-
11	Appropriate for the audience's level of comprehension	74.3	-	25.7	-
12	Using technical and unfamiliar terms	2.7	89	7.3	1
13	User-friendly and understandable without assistance	71.6	-	28.4	-
14	Bringing up behavior easily	45.9	4.6	31.2	18.3
15	Placing the key concept at the beginning of the message	37.6	16.5	34.9	11
16	Creating readable content	75.2	1.9	22.9	-
17	Use images that match the content of the message	29.4	29.3	33	8.3
18	Using visual effects (such as photos, drawings, tables)	19.3	36.7	33	11
19	Proper Framing, page layout and text arrangement	23.8	14.7	53.2	8.3
20	Use important phrases to separate sections/paragraphs	12.8	39.4	38.5	9.2
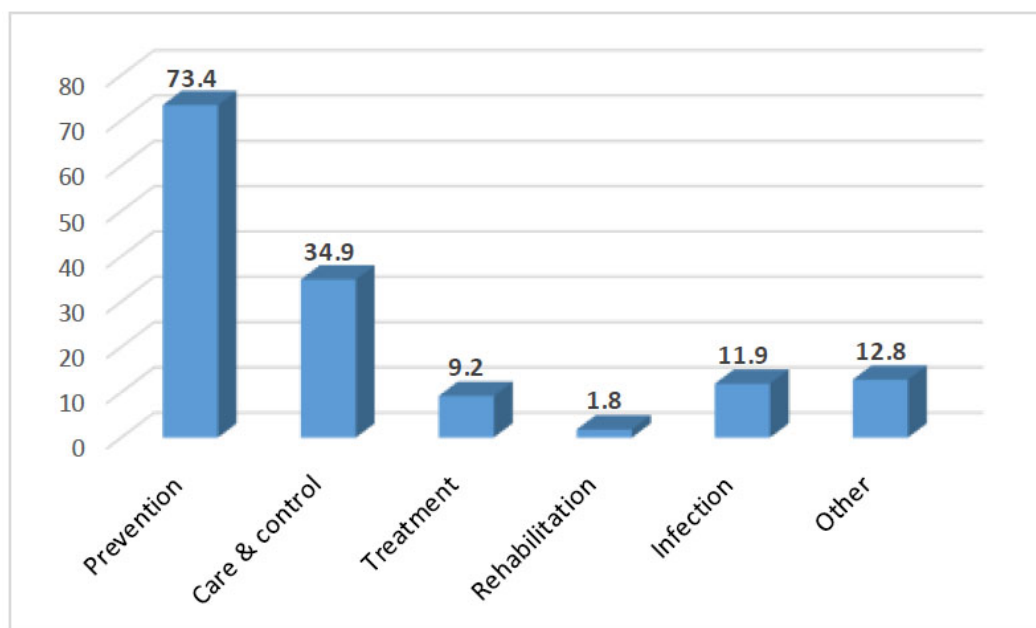
Fig. (1). The view of experts on the rate of distribution of news message content based on the dimensions of prevention, care and control, treatment, rehabilitation, infection, and other aspects of the COVID-19 disease on the AJUMS website in 2020 (n=109).

Only two of the websites studied had archives of news related to COVID-19 media coverage. The archives were organized by topic, downloadable content, newsiness of the message, and other things.

Data analysis revealed that 73.4% (80/109) of news messages focused on the prevention of COVID-19 transmission, while only 34.9% (38/109) addressed the management and control of the disease (Fig. **1**). Fig. (**2**) shows that 89% (97/109) of the message content was aimed at the general public, while 16.5% (18/109) was related to patients and only 14.7% (16/109) was focused on people in contact with the patient.
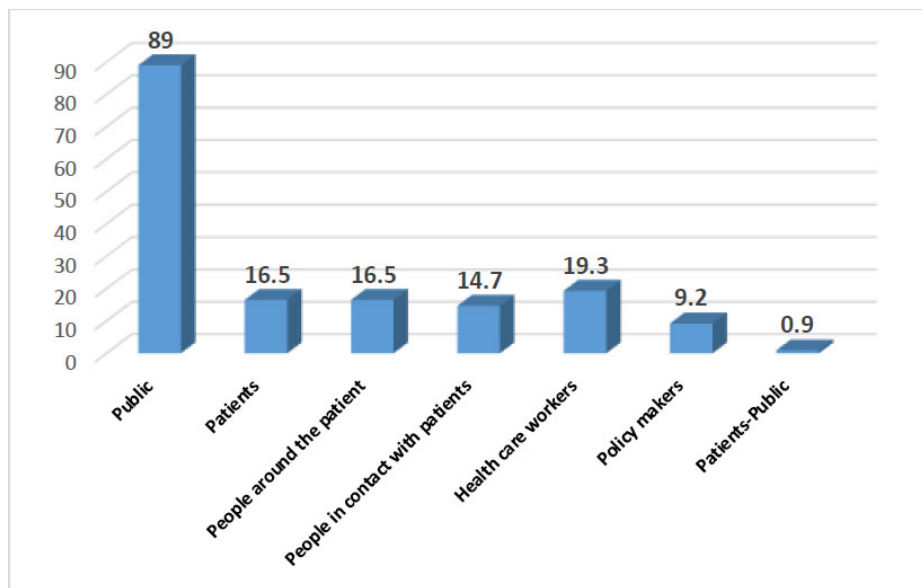

Fig. (2). The view of experts on the rate of distribution of news message content of COVID-19 disease based on the type of audience such as the public, patients, people around the patient, people in contact with patients, healthcare workers, policymakers, patients-public at the AJUMS website in 2020 (n=109).
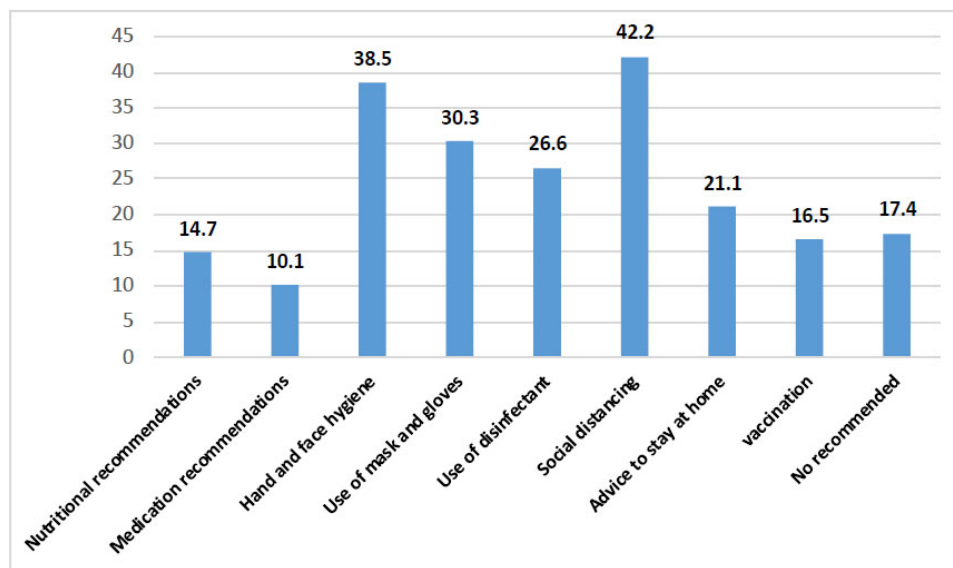

Fig. (3). The view of experts on the rate of distribution of news message content of COVID-19 disease based on the type of recommendations such as nutritional, medication, hand, and face hygiene, use of masks and gloves, use of disinfectant, social distancing, avoiding staying at home, vaccination, and none at the AJUMS website in 2020 (n=109).

Approximately 42.2% (46/109) and 38.5% (42/109) of messages contained recommendations for social distancing and proper hand and facial hygiene, respectively. Of concern, only 16.5% (18/109) of messages recommended vaccination, and 17.4% (19/109) contained no recommendations at all (Fig. **3**). Only 11% (12/109) of messages targeted guilds, while 92.7% (101/109) were general messages that did not address a specific situation (Fig. **4**).

Evaluators' analysis revealed that 45% (49/109) of the messages were found to have a news tone, while 23.9% (26/109) had a persuasive tone. In addition, 9.2% (10/109) of the messages had a threatening tone, and 21% (23/109) kept a balance between persuasive and threatening elements.

The analysis shows that 46.8% (51/109) of the messages were about physical health, while 41.3% (45/109) were about social health and 22% (24/109) were about mental health. About 17.4% (19/109) of the messages were related to emotions management. Of note, about 27.5% (30/109) of the messages did not relate to any specific dimension of health.

Fleiss' kappa coefficient was utilized to assess inter-rater agreement. It extends Cohen's kappa to account for more than two raters. Based on this measure, there is a slight level of agreement regarding the clarity and comprehensibility of the questions, as well as the overall instrument score. These questions exhibit the required level of stability and certainty. In contrast, the questions on the nature of the content, scientific documents, and evidence show moderate agreement, but cannot demonstrate the required level of stability and certainty.

The results indicate that there was reasonable agreement among raters for questions on visual presentation and appearance of content design, suggesting a high level of confidence and consistency.
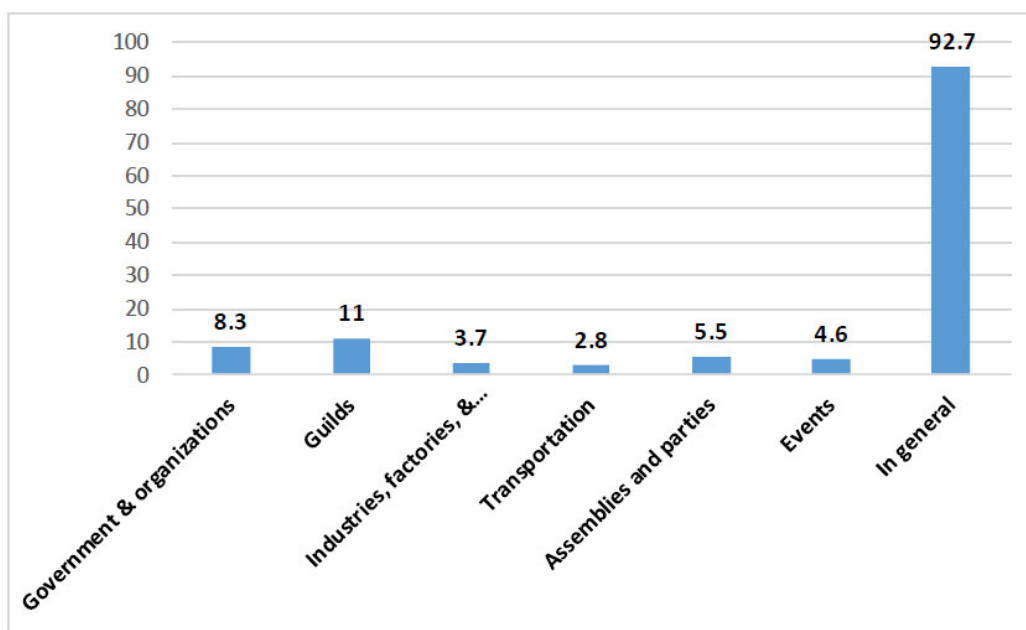

Fig. (4). The view of experts on the rate of distribution of news message content of COVID-19 disease based on the different situations such as government and organizations, guilds, industries, factories, transportation, assemblies and parties, events, and in general, at the AJUMS website in 2020 (n=109).

Table 2. Descriptive statistics of the agreement coefficient between experts at the AJUMS website in 2020 using Fleiss kappa (n=109).

-	Fleiss Kappa	Z	p-v	Lower to Upper CI	Strength of Agreement
Content type	0.05	1.22	0.22	0.03 to 0.12	Slight agreement
Scientific evidence	0.03	1.20	0.23	0.02 to 0.08	Slight agreement
Scientific ability and accuracy	0.23	3.40	0.001	0.1 to 0.37	Fair agreement
Fluency and simplicity	0.14	8.76	<0.001	0.11 to 0.18	Slight agreement
Appearance of content design	0.23	12.23	<0.001	0.20 to 0.27	Fair agreement
Overall	0.09	16.78	<0.001	0.08 to 1	Slight agreement

Although the Fleiss-Kappa agreement coefficient for the questions in the Strength and Scientific Precision sections indicated good agreement, the stability of the raters' level of certainty was questionable (Table **2**).

4. DISCUSSION

The study evaluated the quality of COVID-19 news on the websites of Ahvaz Jundishapur University of Medical Sciences and its affiliated units. It found that only two media websites had COVID-19 news archives, which are organized historical records of an organization's performance over time. These archives are comprehensive and regularly updated, indicating a commitment to providing accurate and up-to-date information to its audience. This is important during a pandemic, as having accessible and well-maintained archives contributes to transparency and accountability in reporting COVID-19 news. The study underscores the importance of preserving and organizing information for easy retrieval and reference, especially during global health crises like the COVID-19 pandemic.

The Iranian media industry lacks proper archiving systems, forcing people to rely on memory and online searches for past news. This poses a challenge for those seeking reliable information and underscores the need for a comprehensive archiving system to preserve history and ensure accuracy. Establishing digital and physical archives can improve efficiency, facilitate research, and prevent data loss. Proper archiving is critical to historical accuracy and supporting progress.

Effective health messages can encourage healthy behaviors, but most current messages focus on COVID-19 prevention and management, with insufficient attention to disease treatment and rehabilitation methods. This is concerning, as individuals may resort to self-medication due to a lack of knowledge. Overall, more attention should be paid to proper treatment methods to improve the health and well-being of those affected by a disease [32, 33].

Self-medication can result in serious consequences such as misidentifying illnesses, delaying medical treatment, harmful drug interactions, severe adverse effects, incorrect dosage, concealing ailments, and an increased risk of substance abuse. To ensure the health and well-being of the community, it is important to address these negative consequences of self-medication [34].

The analysis found that the majority of health messages (89%) were directed at the general public, with only a small proportion targeting patients, caregivers, or those who interact with them. This is concerning as even though there is a high risk of anonymous spread of COVID-19, close contacts and caregivers of infected individuals are not getting tested for the virus. This can easily result in the virus being spread within the community, leading to an increase in the number of patients [35].

Upon analyzing the website's recommendations, it becomes clear that the majority of advice focuses on social distancing and proper hand hygiene practices. Meanwhile, nutrition, drug treatment, rehabilitation, and vaccination recommendations are considered less significant by comparison.

To prevent COVID-19 spread, all relevant guidelines must be included in educational materials. Neglecting critical strategies can harm pandemic control, so comprehensive information dissemination is crucial. Emphasizing all aspects of preventive actions maximizes impact and builds public trust [36]. Designers should consider all recommendations to increase messaging effectiveness and avoid conspiracy theories.

A lack of knowledge of proper treatment practices can lead to harmful behaviors like self-medication or reliance on unverified drugs [37]. Educating individuals on appropriate techniques is crucial to prevent such practices and promote evidence-based medical practices. Reliable information on treatment options must be available. Educating people on effective ways to address health concerns will mitigate potential risks. Improved health literacy within communities can significantly improve well-being.

In terms of the specificity of the messages for particular groups and situations, a small percentage of the examined messages targeted industries, factories, educational centers, and transportation. However, the content of the majority of the messages was not related to specific contexts or conditions. Even though experts in health psychology emphasize the importance of providing accurate information about the context and purpose of behavior and messaging when communicating health information [38]. However, many people fail to acknowledge this crucial aspect. It is imperative to understand that the context in which health information is disseminated has a significant impact on how it is perceived and adopted. Therefore, providing accurate context and messaging is crucial to improving health outcomes.

On a positive note, the published messages were strong in that they covered almost all situations, including ceremonies, celebrations, Ramadan, guilds, organizations, offices, and industries. This feature made them efficient and effective in their reach.

The analysis of the website messages found that the majority of the published content (45%) had a news-oriented aspect, focusing on presenting disease and mortality statistics and adopting a threatening approach. However, only a very small percentage of the messages integrated a combination of news, encouragement, and warnings.

Experts found that 23% of reviewed health-related messages were disrespectful. To increase effectiveness, messages should incorporate mixed content instead of being only threatening, persuasive, or respectful. A variety of different types of content make messages more engaging for audiences. Using various techniques can make our messages more impactful and effective in captivating and retaining attention [39].

The study found that the majority of messages focused on physical and social health, with less than 20%

addressing psychological health. Unfortunately, the spiritual aspect was largely disregarded. Recent research has shown that the pandemic has hurt individuals' spiritual well-being [40, 41]. Therefore, it is vital to prioritize the spiritual aspect of health. Neglecting this dimension can hinder us from achieving complete physical, mental, and emotional wellness.

Regarding the credibility of the message, coordinated and consistent message content, accuracy in writing phrases, understanding and awareness of the audience, simplicity of the message, and readability, the published messages had a favorable situation.

The published messages lacked reliability, accuracy, and consistency with other media. They should have included up-to-date scientific sources, avoided contradictions, and used simple language. Key concepts should have been presented at the beginning, and appropriate images could have been used. The layout should have been done appropriately, with a clear section and paragraph separation for better readability. Improving these aspects could have made the message more effective (Table **2**).

Effective communication through media requires more than just scientific accuracy. Clear language, attention-grabbing headlines, visuals, relatable stories, personal anecdotes, and repetition increase success and prevent belief in conspiracy theories or pseudoscience [42]. COVID-19 posed a challenge for crafting messages due to limited evidence on the novel topic, making accurate communication difficult.

According to the results of a review article, it is important to consider several factors when designing messages for behavior change. These include assessing if the target audience is already engaging in the recommended behavior, emphasizing desired outcomes and advantages of changing behaviors, raising awareness of potential harm for those who do not see the risk as high, and tailoring messages to unique needs and challenges of the target audience using an exploratory approach. By following these principles, messages can be designed that are applicable, clear, useful, precise, and effective in promoting behavior changes [43]. Therefore, it is important to consider people's perceptions and cultural backgrounds when designing and implementing health promotion interventions [44].

In general, it can be said that the scientific power and precision of the published messages are not desirable, more importantly, they often lack practical tips and fail to make a significant impact on the audience. This is even though according to the guidelines of effective communication, the validity and practicality of the message are of great importance [43]. Therefore, to ensure trustworthy, timely, and factual information for the audience, decision-makers should consult with experts when crafting messages. Experts provide accurate and reliable communication that is easy to understand. They can be particularly helpful in designing public information campaigns and crisis communications. Decision-makers should consider hiring experts to help them craft

messages that effectively reach their intended audience and achieve their goals.

The Fleiss kappa showed that questions about content type, scientific documentation, evidence, and accuracy lacked stability. This means the website assessment instrument needs improvement for better accuracy.

The Fleiss kappa coefficient of agreement can have a low value due to several reasons, including non-random selection of raters and the use of incompatible evaluators. These factors can lead to biased results and inconsistencies, which can hinder the accuracy of conclusions. To obtain accurate results when using Fleiss kappa analysis, it is crucial to adhere to specific requirements and assumptions that are fundamental and cannot be overlooked.

5. LIMITATIONS OF THE STUDY

The present study only considered the perspectives of specialists and experts and did not take into account the perceptions of message recipients. Additionally, the message design only included elements listed in Table **1** and did not explore other essential factors such as perceptive aspects, fear, and message framing [45]. To gain a more comprehensive understanding of the topic, additional research is advisable while considering the constraints of the current study.

6. STRENGTHS OF THE STUDY

This study had several strengths, including the ability to measure the impact of messages through web-based services and involvement and consultation with social and behavioral science experts, resulting in an efficient response to the pandemic. Additionally, creating a set of indicators to measure policy effectiveness in preventing and controlling COVID-19 was invaluable in ensuring that policies were yielding excellent results in curbing the spread of the virus.

CONCLUSION

The majority of messages lack acceptable standards in terms of content types, scientific documentation and evidence, scientific strength and precision, fluidity and simplicity of the message, as well as overall appearance and design. Effective science communication requires adherence to established standards to ensure information is correctly conveyed and easily accessible. Decision-makers must collaborate with experts to create messages that are supported by empirical evidence while catering to their target market's needs for effective communication. Creating reliable educational content in the health field can positively impact the health of individuals and improve their overall outcomes. The tool developed in this study offers a valuable opportunity to assess the quality of messages on different health-related topics, and future studies should explore the psychometric properties of this tool.

AUTHORS' CONTRIBUTION

All authors collaborated on this article's conceptualization, planning, implementation, and evaluation. They contributed to research, data analysis, interpretation, and

manuscript revision. The authors share accountability for content accuracy and precision by finalizing this article.

LIST OF ABBREVIATIONS

WEBDA = Website of Ahvaz University of Medical Sciences

AJUMS = Ahvaz Jundishapur University of Medical Sciences

ETHICAL STATEMENT

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

Data supporting the findings of this article are available by request from the corresponding author [H.M].

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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APPENDIX 1

This is a questionnaire to evaluate the Covid-19-related text messages on websites of medical sciences universities and the cyberspace.

A- Demographic questions

1. Age (Year): ....

2. Gender:

a) male ☐ b) female ☐

3. Years of service:

a) Less than 5 years ☐ b) 5-10 years ☐ c) more than ten years ☐

4. The level of your education:

a) Bachelor's degree ☐ b) Master's degree ☐ c) Ph.D. ☐

5. Do you have a history of producing, designing, or evaluating educational content on health?

a) Yes ☐ b) No ☐

B) Message specifications

1. The number of the message under review

2. The message under review was published on the website/ blog of which organization/entity?

a) Vice Chancellor of Health b) Vice Chancellor of Treatment

c) Vice Chancellor of Food and Medicine d) University of Medical Sciences and the affiliated faculties

♦ **Message archive**

3- Is there an archive of Covid-19-related messages on the website/blog under review?

a) Yes b) No

4- If the answer to the previous question is yes, based on which of the following is this archive configured?

a) The subject of the message b) Downloadable content c) Newsiness of the message

d) Other

♦ **Content type**

5- Which aspect of the disease does the content of the message in question address?

a) Disease prevention b) Disease care and control

c) Disease treatment d) Rehabilitation

6- Which of the following is addressed by the message content?

a) The public or the patients b) People around the patient

c) People in contact with the patient d) Health system employees

e) Policy makers

7- The recommendations of the message involve which of the following?

a) Nutritional recommendations b) Drug recommendations

c) Hand and face hygiene d) Use of masks and gloves

e) Use of disinfectants f) Social distancing g) Advice to stay at home

8- The recommendations of the message are for which of the following contexts?

a) Government departments and organizations

b) Guilds (such as shops, barbershops, *etc.*)

c) Industries, factories, and educational centers (*e.g.*, schools and universities)

d) Transportation system (*e.g.*, taxis, buses, *etc.*)

e) Meetings, parties, and special occasions (*e.g.*, the holy month of Ramadan, processions)

9- What is the message tone?

a) Threatening b) persuasive c) Mixed

10. The message is not insulting and does not blame people?

A) Yes B) No C) Somewhat D) Not applicable

11- Does the composition of the message include sufficient evidence for threats or benefits?

a) Yes b) No c) Somewhat

12- Is the message believable?

a) Yes b) No c) Somewhat

13- Which of the following topics does the content of the message address?

a) Emotion management b) Mental health

c) Physical health d) Social health e) Spiritual health

♦ **Documents and scientific evidence**

14- Is the content of the message based on reliable and up-to-date scientific sources and the latest guidelines?

a) Yes b) No c) Somewhat

15- Does the content of the message contradict those of other media that have been created in the context of the mentioned topic?

a) Yes b) No c) Somewhat

16- Are the presented materials coordinated and in harmony with each other?

a) Yes b) No c) Somewhat

17- Does the media content have additional information?

a) Yes b) No c) Somewhat

♦ **Scientific ability and accuracy**

18- Is jargon used in the content of the message?

a) Yes b) No c) Somewhat

19- Is the accuracy observed in writing the message (in terms of spelling/grammar/writing conventions)?

a) Yes b) No c) Somewhat

♦ **Fluency and simplicity of the message**

20- Does the intended content have the necessary fluency and simplicity in relation to the audience and its

target group?

a) Yes b) No c) Somewhat

21- Is the desired content adapted to the understanding of the target audience?

a) Yes b) No c) Somewhat

22- Is jargon or Latin (unfamiliar) terms used in the content of the message?

a) Yes b) No c) Somewhat

23- Is the content of the message composed so that the audience can use it without receiving the guidance and help of others?

a) Yes b) No c) Somewhat

24-Is the recommended behavior in the message easily stated?

a) Yes b) No c) Somewhat

25- Is the key concept placed at the beginning of the message?

a) Yes b) No c) Somewhat

♦ **Appearance of content design**

26- Is the content of the message readable?

a) Yes B) No C) Somewhat

27- Does the message include images appropriate to the content?

a) Yes b) No c) Somewhat d) Not applicable

28- Are visual effects (*e.g.*, photos, figures, tables) sufficiently used in the content of the message?

a) Yes b) No c) Somewhat d) Not applicable

29- Does the message include appropriate framing, page and text layout?

a) Yes b) No c) Somewhat d) Not applicable

30- Are important phrases (bolded or underlined) used to separate sections/paragraphs?

a) Yes b) No c) Somewhat d) Not applicable

√ **Tool guide.**

General characteristics: Items 1 to 5	Documents and scientific evidence: Items 14 to 17
Message specifications: Items 1 and 2	Scientific ability and accuracy: Items 18 and 19
Message archive: Items 3 and 4	Fluency and simplicity of the message: Items 20 to 25
Content type: Items 5 to 13	Appearance of content design: Items 26 to 30

APPENDIX 2

Links to the reviewed websites:

1. https://ajums.ac.ir/
2. ttps://fmedicine.ajums.ac.ir/
3. ttps://fhealth.ajums.ac.ir/
4. https://fpharmacy.ajums.ac.ir/
5. ttps://frehabilitation.ajums.ac.ir/
6. ttps://fparamedicine.ajums.ac.ir/
7. https://fdentistry.ajums.ac.ir/
8. https://fnursing.ajums.ac.ir/
9. https://vchmedical.ajums.ac.ir/
10. ttps://vchhealth.ajums.ac.ir/
11. https://vcheducation.ajums.ac.ir/
12. https://hn-wah.ajums.ac.ir/
13. https://hn-ize.ajums.ac.ir/
14. https://hn-mis.ajums.ac.ir/
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