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Review Article

Emergence of Science Communication During the COVID-19 Pandemic: A Literature Review

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Abstract *- The COVID-19 pandemic underscored the significance of effective science communication in addressing global health crises. The spread of Misinformation and ambiguity led to public frustration and anxiety, highlighting the need for transparent, credible, and easily accessible scientific information that is more pressing than ever. In light of this, the present literature review evaluates how science communication has evolved during the COVID-19 pandemic, focusing on the approaches, channels, and actors involved in disseminating public health messages. This review analyses 22 articles published between 2019 and 2025, using keywords such as "COVID-19", "pandemic", "science communication", and "trust" from electronic databases, including Google, Google Scholar, and PubMed, emphasising trust in scientific information, the influence of mass media, and communication challenges. The findings revealed the significant role of science communication in raising public awareness, fostering behavioral change, countering Misinformation, and promoting swift decision-making by health officials and policymakers. These insights could be crucial for government authorities, healthcare professionals, and media publishers in shaping public understanding and behaviors. However, these reviews concluded with key lessons and essential practices to guide future science communication strategies in public health emergencies.*

Keywords *- COVID-19 Pandemic, Health crisis, Literature review, Misinformation and disinformation, Science communication.*

1. Introduction

Throughout the Coronavirus outbreak, the World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC), and other reliable national public health authorities emphasised that scientists should create and disseminate science-based, accurate information to the public (Fleming, 2020). Since the onset of the COVID-19 pandemic, the public has been overwhelmed with correct and incorrect information, leading to significant confusion about reducing virus spread and ensuring personal safety (Albrecht et al., 2022). Scientific messages and guidelines were necessary during the pandemic to identify the authentic information to save life and society (Intemann, 2023). During this pandemic, the distribution of reliable information has become one of the most vital elements of the public health response. The world recognised the urgent need for rapid, credible communication before this pandemic (Kudchadkar & Carroll, 2020).

Additionally, disseminating accurate and trustworthy information is vital for controlling outbreaks in a global public health crisis during the pandemic. Timely and truthful communication helps individuals take appropriate precautionary measures and manage the situation effectively, contributing to positive health outcomes (Voeten et al., 2009). Globally, governments and the public were initially unaware of this new virus, its dangers, its transmission methods, and the best ways to protect people. For a pandemic response to be effective during such a perilous time, it must be guided by high-quality scientific advice. Science plays a significant role in contemporary society, and effective science communication has been crucial throughout the COVID-19 pandemic. Moreover, scientists have developed all precautions against this virus, including vaccines to protect people (Ashwell, 2023, p.46).

The COVID-19 pandemic created a global challenge that could be addressed using scientific knowledge. Throughout the pandemic, awareness of the virus and science-based information represented the most crucial weapons in combating this crisis. Moreover, successfully managing the problem relied heavily on people's trust in science (Bavel, 2020; Travis et al., 2021; Battiston et al., 2021). During this time, significant ambiguity existed surrounding transmission, symptoms, and their effects; neither governments nor the public were adequately prepared or equipped with the essential knowledge to confront this crisis. Consequently, governments and scientific experts delivered emergency support and guidance to help control the spread of the virus (Paek & Hove, 2020; Fernandes, 2021; Costa-Sánchez & Peñafiel-Saiz, 2022). This pandemic highlighted the crucial

role and responsibility of science communication in informing individuals and guiding the development and implementation of health initiatives to reduce the spread of the virus (Bromme, 2022).

Most countries responded to the COVID-19 pandemic by adopting science-based health strategies, regardless of their different political structures and cultural contexts. During the COVID-19 pandemic, Argentina implemented a comprehensive health response guided by scientific information. South Korea ensured trustworthy communication through daily press briefings that adhered to the CDC and WHO's COVID-19 mitigation guidance. Simultaneously, New Zealand conducted regular televised press briefings led by their Prime Minister, Jacinda Ardern, and Director General of Health, Dr Ashley Bloomfield, fostering public trust and engagement. Despite political and cultural differences, Argentina, South Korea, and New Zealand exemplified science-led, clear, and effective Communication (You, 2020).

Science communication has a long history of aiding in managing various pandemics and epidemics. However, the COVID-19 pandemic marked the beginning of a new era shaped by digital technologies and communication platforms. This raises the question of what science communication entails and its necessity to control this pandemic. According to Burns et al. (2003), science communication consists of using accurate methods and channels to develop public awareness, concepts, scientific literacy and the nature of accurate information. This credible communication encouraged public interest and trust and promoted the creation of a scientific environment in any society (Burns et al., 2003). Metcalfe et al. (2020) highlighted the relationship between science and society during this pandemic. They reported that society was dependent on the scientific community for all kinds of virus control-related information and guidelines (Metcalfe et al., 2020)). Moreover, science communication typically shifts away from a top-down model, encouraging a dialogue between scientists and the general public (Bucchi et al., 2016). Especially during the COVID-19 crisis, this approach to communication became essential, with governments worldwide taking the lead in disseminating scientific guidelines regarding the pandemic.

Health communication contributes greatly to society, specifically in any health crisis when trustworthy communication is crucial (Beltrán, 2020). The COVID-19 pandemic led to considerable scientific publications emphasising the virus, its symptoms, and safety measures. Compelling science communication findings assist policymakers by helping them apply this concept to create evidence-based policies. During this pandemic, scientists contributed significantly to problem-solving efforts and helped policymakers make the right decision (Weible et al., 2020; Bromme et al., 2022). Many papers were issued for conferences, and a distinct journal focused on the interrelation between communication and the pandemic (Croucher & Diers-Lawson, 2023).

The Novel Coronavirus pandemic has also significantly highlighted the process of health science research (Caulfield et al., 2021). Submission rates of the most essential biomedical journals rose gradually, with some accepting up to three times their normal volume (Bauchner et al., 2020). This pandemic significantly relied on scientific information, including the terms quarantine, isolation, outbreak, vaccine, Personal Protective Equipment (PPE), mask, social distancing, lockdown, etc. Analysing science-based publications is necessary during the pandemic to enhance visibility, improve, and increase impact.

After a critical review of the literature, as mentioned above, a good number of research studies on science communication regarding COVID-19 have been conducted from a global perspective. Though a considerable amount of academic research has been carried out on science communication throughout the Coronavirus pandemic, notable gaps persist. Existing literature extensively focuses on financially developed countries and highlights government communication or central media messaging while overlooking community-level communication from a South Asian perspective. Moreover, minimal studies have investigated the long-term changes in the science communication process during the post-pandemic or evaluated the efficiency of these approaches through data-driven measures. This review aims to close that gap in the existing literature. In addition, the study findings also provide valuable insights into the existing knowledge on this issue. However, this literature review attempts to comprehend the science communication during COVID-19, focusing on the tactics, channels, and performers involved in disseminating public health messages. By analysing studies through 2025, this paper emphasises developing science communication approaches across time, including scientific practices. Additionally, this review highlights the significance of using analytical tools to measure the outcome of public health messaging, fostering greater importance for data-driven assessments and underscoring the necessity of culturally relevant, community-led science communication. This review is also critically important for culturally and linguistically varied contexts such as Bangladesh.

2. Materials and Methods

The present literature review focuses on the emergence of scientific communication globally during the Coronavirus pandemic. Based on scholarly publications, this review article explores how scientific information assisted the public, policymakers, and others in combating Misinformation and addressing the pandemic. Electronic databases such as Google, Google Scholar, Web of Science, and PubMed were primary sources for gathering relevant

literature. The search was conducted using fixed keywords, including "*COVID-19 Pandemic", "Health crisis", "Literature review", "Misinformation and disinformation" and "Science communication"*. Twenty-two recent articles that included these terms in their title or abstract and were published between 2019 and 2025 were identified for this review. These articles concentrated on the growing role of science-based communication during the 1pandemic, the approaches employed by scientists and communicators, the role of media, and the challenges faced in disseminating complex scientific information to diverse audiences. These articles also highlighted how science communication influenced public perception, trust in science, and policy decisions. The following tables present the details of the selected literature on science communication during the COVID-19 pandemic.

3. Review of Selected Literature on Science Communication during the COVID-19 Pandemic

Article No	Author, Publishing, and Year	Journals, publishers, Volume and Country	Objectives and Methods	Key Findings
1.	Matta, G 2020	Humanities and Social Sciences Communications, published by Springer Nature, Vol. 7 (1), India	Based on a recent literature review and WHO guidelines, this study utilised multidisciplinary approaches to explore the role of science communication in enhancing preparedness, public awareness, and response during epidemics and pandemics.	During and after the COVID-19 pandemic, science communication helped to promote scientific understanding, prevent COVID-19, and counter Misinformation.
2.	Albrecht et al., 2022	Public Health Reports, Vol-137(3), Sage, USA	This study used a multifaceted methodology, including an interdisciplinary approach to science communication, risk reduction model, and two-way communication, to analyse the use of social media in countering Misinformation.	Social media provided science-based information on COVID-19 awareness, promoted media literacy, assisted people in combating Misinformation, engaged heterogeneous audiences through a question-and-answer procedure, and bridged the gap between scientists and public needs.
3.	Chan et al., 2022	Public Health, Vol. 218. ELSEVIER publishers, UK.	A mixed-methods design combining qualitative content analysis with quantitative time-series modelling was applied to examine the correlation between people's mobility and the importance of NOS in UK news media.	During the COVID-19 pandemic, some particular scientific content helped to shape public behavior in the United Kingdom.
4.	Lorenzoni et al., 2025	Frontiers in Communication journal, Frontiersin.org, Vol. 10, Austria.	A qualitative research design was used to conduct semi-structured interviews with 13 Austrian scientists to evaluate their experiences, challenges, and advice on science communication during the COVID-19 pandemic.	Thirteen Austrian scientists mentioned several challenges in conveying scientific messages during the COVID-19 pandemic. Though circumstances were challenging, they emphasised the importance of trustworthy scientific communication.

5.	Khosla & Pillay, 2020	Journal of Science Communication, Published by SISSA Media Lab. Vol-19(05), Australia.	This article analyses 23 active Facebook groups in eight South Pacific Countries, focusing on the application, context, and adaptation of COVID-19-related scientific terminology in social media conversations.	The people of the South Pacific Countries effectively utilised Facebook's COVID-19 scientific terms and information, demonstrating the importance of understanding cultural dynamics for successful scientific communication.
6.	Heras-Pedrosa et al., 2022	International Journal of Environmental Research and Public Health (IJERPH), MDPI, Vol-19(1705), Spain.	The bibliometric study uses the Web of Science database to analyse journal indexes for 2020-2021, focusing on pandemic-related scientific health communication studies and identifying key research themes.	COVID-19-related scientific publications increased drastically; 63.38% were published in 2021. A total of 1505 citations were obtained from publications in 2020 and 2021.
7.	Fleerackers et al., 2022	Health Communication Journal, published by Taylor & Francis Vol-37(6), Canada	The study utilised quantitative content analysis to analyse 2527 COVID-19-related preprints from medRxiv and bioRxiv, identifying outlets and examining how scientific ambiguity is framed in digital reporting.	During the early attack of the pandemic, diverse media covered COVID-19-related preprints more than at any other time, extensively using hyperlinks and varied framing to highlight scientific uncertainty.
8.	Mandl et al., 2023	The Journal of Knowledge, Publisher MDPI, Vol. 3, Switzerland	The study utilised a mixed-methods approach to analyse 21 science-based YouTube videos related to COVID-19 in German and 49 German-speaking Twitter channels.	Social media (Twitter) provided scientific information and shaped public behaviors during the COVID-19 pandemic. Additionally, positive feedback from viewers was highlighted.
9.	Caulfield et al., 2021	FACETS, a multidisciplinary open-access science journal, published by Canadian Science Publishing, Vol. 6, Canada	This study applied a qualitative method, using narrative synthesis and critical discussion to examine the representation of science communication during the COVID-19 pandemic.	The perseverance of COVID-19-related scientific information was significantly high, and the authors advocated for detailed, clear, and transparent discussion between scientists, the media, and the general public.
10.	Pimenta et al., 2020	Medicine journal, Published by Wolters Kluwer Health, Inc., Vol. 99, Brazil	The study used a systematic review protocol to examine the impact of COVID-19-related scientific communication on mental health and practical communication approaches, analysing data using RevMan 5.3.	Systematic reviews showed that social media disseminated scientific information promoting the mental health of people during the COVID-19 pandemic.

11	Besançon et al., 2021	Journal of BMC Medical Research Methodology, published by Springer Nature (under the BioMed Central (BMC) imprint), Vol. 21, UK	The study utilised retrospective document analysis to scrutinise 29 retracted publications from the Retraction Watch Database, aiming to enhance transparency in science communication and research quality.	Emphasis was placed on appropriate methodology and preregistration of COVID-19-related pharmacological studies to disseminate the correct information and reduce duplication. Additionally, this study highlighted the need for transparent scientific practices.
12.	Capurro et al., 2021	Journal of BMC Public Health, published by Springer Nature (under the BioMed Central (BMC) imprint), Vol. 21, Canada.	The study utilised qualitative methodology, specifically framing analysis, to analyse 1143 Canadian newspaper articles about COVID-19. It identified keyframing strategies and guided effective risk communication.	A total of 1,143 Canadian scientific news stories during COVID-19 revealed that clear communication was crucial for managing uncertainty, with the media being the most reliable source of health education.
13.	Antiochou, K. 2021	Journal of History and Philosophy of the Life of Sciences (HPLS), published by Springer Nature Switzerland AG, Vol. 43. Switzerland.	This study uses philosophical and conceptual analysis to explore language, metaphors, and conscientious dilemmas in science communication. It aims to evaluate the challenges in disseminating COVID-19 precautionary information amid uncertainty and Misinformation.	Focused on the complex challenges of science communication throughout the COVID-19 pandemic, particularly language, metaphors, and uncertainty.
14.	Bavel et al., 2020	Nature Human Behaviour journal, published by Springer Nature, Vol. 4, Switzerland.	This qualitative study applied narrative review methodology, integrating existing empirical research through the social and behavioral sciences. It used thematic analysis to detect insights into the COVID-19 pandemic response.	Reliable social and behavioral science assisted leaders and individuals in managing threats, combating Misinformation, fostering cooperation, and developing communication during the COVID-19 pandemic.
15.	Celi, L. 2020	Preprint copy, electronic copy available at: https://ssrn.com/abstract=3657492, Italy	The study used a mixed-method approach to investigate the impact of early underestimation of COVID-19 in Italy, influenced by scientific ambiguity and risk communication, on public perception during the pandemic.	During the COVID-19 pandemic, science communication was the only weapon against Misinformation. It disseminated the lockdown message, positively changed customer behaviours, and managed waste in Italy.
16.	Pollet& Rivers	Clinical Infectious Diseases journal, published by Oxford	This qualitative study applied descriptive analysis based on public scientific discourse to	Twitter became an essential channel for exchanging scientific information about the

	2020	University Press for the Infectious Diseases Society of America, Vol. 71, USA	analyse Twitter's role in fostering timely scientific communication during the early stages of the COVID-19 pandemic.	COVID-19 pandemic, including genomic data, epidemiological status, and efforts to counter Misinformation.
17.	Dudley et al., 2021	Vaccine journal, published by Elsevier, Vol. 19, Netherlands.	This qualitative descriptive study implemented purposive sampling and thematic content analysis to investigate the communication challenges faced by scientists during the COVID-19 pandemic.	This study highlights the challenges scientists faced in balancing accuracy and clarity when communicating about COVID-19 vaccines, focusing on messaging and better communication training to enhance public trust and improve vaccine uptake.
18.	León, et al., 2022	Church Communication and Culture journal, published by Taylor and Francis Group, Vol. 7, United Kingdom	This qualitative conceptual study applied narrative review and critical analysis strategies to investigate the dynamics of scientific messages during the COVID-19 pandemic.	This study explores COVID-19 misinformation driven by rapid scientific publications, media misrepresentation, and politics. It also stresses the need for experts in science communication to bridge the gap between research and public trust.
19.	Wiles et al., 2023	Frontiers in Communication journal, published by Frontiers Media S.A., Vol. 8, Switzerland.	The study utilised Zoom interviews to investigate the role of visual science communication in raising public awareness about COVID-19 and enhancing global health messaging during the pandemic.	New Zealand microbiologist Siouxsie Wiles and cartoonist Toby Morris introduced a highly influential science communication Collaboration, producing more than 70 graphics regarding the COVID-19 pandemic. This visual scientific storytelling helped people combat Misinformation and enhanced their knowledge of virus control.
20.	Evans, R., 2021	Journalism Education journal, published by the Association for Journalism Education (AJE), Vol. 10, United Kingdom.	This qualitative study implemented action research and document analysis to examine how journalism students from two London universities engage with scientific ideas. It used thematic analysis to discover threshold ideas that define the improvement of science journalism thinking.	Scientific literacy in journalism became very crucial during the COVID-19 pandemic. Science journalism has gained society's trust and helped people reduce vaccine hesitancy. This study emphasised the necessity for trustworthy and informed reporting on science, technical systems, health, and the environment.
21.	Araujo & Costa, 2023	Journal of Human Affairs, published by Walter De Gruyter GmbH, Vol. 34,	A qualitative study surveyed 100 pre-COVID documents to gather evidence-based science communication	This study focused on early warning of pandemics, which is necessary to control any pandemic and assist science

		Germany.	information for future pandemics, analysing content using content analysis.	communicators in enhancing public understanding of scientifically grounded pandemic preparedness.
22.	Moradian et al., 2020	Journal of Translational Medicine, Published by BioMed Central (BMC), Vol. 18, United Kingdom	This qualitative study uses a review-based framework, analysing expert statements and literature reviews to enhance global scientists' cooperation and response to pandemic preparedness.	This study emphasised global scientists' collaborations necessary to manage the COVID-19 pandemic. Unified scientists' practical efforts can improve public health response and preparedness.

4. Discussion

In early 2020, amid the initial COVID-19 outbreak, the World Health Organization (WHO) gathered more than 300 experts and donor agencies to prioritise research and innovation related to the virus (WHO, 2020a). Furthermore, the scientific community launched the Global Health Network in January 2020 to facilitate COVID-19-related research in low- and middle-income countries (Feune et al., 2020). Oliveira et al. (2021) reviewed 60,830 COVID-19-related scientific publications from the first twelve months. They found that among 178 countries, the USA, China, Italy and England were accountable for 60% of the scientific publications. Additionally, 12 countries (the USA, China, Italy, England, India, Canada, Germany, Spain, Australia, Brazil, Iran, and Turkey) were responsible for 95% of the global scientific output. These contributions prompted public health institutes and research centres to seek solutions for virus transmission, improve preventive measures, and hasten vaccine development (Artigas et al., 2021). Following the identification of the first patients, there was a critical need for reliable information to mitigate the pandemic, compounded by the immense pressure from Misinformation and disinformation.

Consequently, within just ten months of the first confirmed case, over 12,500 scientific studies related to these diseases were published (Fraser et al., 2021). According to Lie et al. (2023), 8% of the COVID-19 articles published between 2020 and 2021 focused on crucial scientific insights pertinent to the pandemic. The swift response from the global community underscored the importance of international collaboration among researchers and public health organisations. This partnership resulted in scientific publications that offered practical strategies for controlling the virus's spread and saving lives during the pandemic (García et al., 2024). Galvez (2023) identified "Telehealth Transformation: COVID-19 and the Rise of Virtual Care" as the most cited research on COVID-19, with 392 citations, averaging 130.7 citations annually.

5. Conclusion

The COVID-19 pandemic created significant vulnerabilities and an unprecedented increase in the demand for scientific information to combat fake news, Misinformation, and disinformation. So far, science communication has played an essential role in this challenging situation. Researchers, scientists, health specialists, and public leaders have collaborated to reduce uncertainty, producing thousands of peer-reviewed studies and policy briefs while using easily accessible language to enhance public awareness about the pandemic. In the 22 articles reviewed, most concluded that clear, trustworthy scientific information was the most vital tool in combating this devastating pandemic, encouraging the public to adopt life-saving behaviours. Additionally, from the review of this literature, several convergent insights emerge. First, collaborative efforts among diverse stakeholders—including ruling authorities, healthcare professionals, researchers, and mass media—proved crucial for strengthening credible information and quickly countering disinformation and Misinformation. Second, despite their dual role as sources of reliable information and false data, social media platforms became essential for reaching diverse audiences, requiring communicators to enhance tailored, culturally sensitive messaging strategies. Third, the surge in preprints and expedited publications emphasised the importance of precise and scientific information to ensure that their trustworthy findings bolster public trust.

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