THE ROLE OF INFORMATION IN INFLUENCING PUBLIC ATTITUDES AND BEHAVIORS IN A GLOBAL PANDEMIC

Mohammed Nasser Al-Suqri[1*], Jamal Mattar Al Salmi[2], Ayida Mohamed Al Shabibi[3]

[1*]Associate Professor, Department of Information Studies, College of Arts and Social Sciences, Sultan Qaboos University, Oman; [2]Assistant Professor, Department of Information Studies, College of Arts and Social Sciences, Sultan Qaboos University, Oman; [3]PhD Student, Department of Information Studies, College of Arts and Social Sciences, Sultan Qaboos University, Oman.

Email: [1*]saqrim@squ.edu.om, [2]alsalmij@squ.edu.om, [3]ayoode80@hotmail.com

Abstract

Purpose of the Study: This study aims to identify key insights from the emerging academic literature relating to the role of information during COVID-19, especially information obtained via social media, and to consider their implications for the authorities responsible for pandemic management.

Methodology: The research is based on a thematic review of 34 academic papers published during the first six months of 2020 when COVID-19 was spreading globally.

Main Findings: The findings demonstrate the critical influence of information as an influence on public attitudes and behaviors in a pandemic, and the important role played by social media in the dissemination of information in this context. They highlight the problem of vast volumes of misinformation and fake news circulating on social media sites and how this can undermine efforts by the authorities to manage the pandemic.

Social Implications: The research findings demonstrate the need for the authorities to utilize social media to counterbalance misinformation and fake news regarding the pandemic, but also highlight the importance of employing a range of information channels and messaging formats to effectively reach and engage all demographic groups. They suggest that key influencers including healthcare experts, high profile public figures, and social media influencers can play an important role in the dissemination of accurate and reliable information on behalf of the authorities in ways that support rather than hinder pandemic management.

Originality/Novelty of the Study: Global pandemics have historically occurred only rarely and this is the first to occur in a new information environment in which people receive much of their information via the Internet and social media. A considerable number of academic papers relevant to this study were published in the first half of 2020, providing an early and unique opportunity to synthesize the key themes and findings and provide helpful insights on the use of social media and other information channels for pandemic management.

Keywords: Information Use, Social Media, Attitudes, Information Behaviors, Global Pandemics, Coronavirus COVID-19.

INTRODUCTION

Global pandemics, fortunately, occur only rarely and as a result, there have been few opportunities to explore the role of information in influencing public attitudes and behaviors in this type of situation. The information environment that exists at the time of the novel coronavirus COVID-19 in 2020 is very different from that which existed during previous pandemics such as the Spanish Flu pandemic of 1918-1919 and even the SARS pandemic of 2002-2003. In this new environment, individuals have immediate access to unprecedented amounts of information from various official and unofficial sources, with much or most of this received in digital format through social media and other online information channels (Starbird et al., 2020).

In their attempts to limit the spread of COVID-19 and ease pressure on health systems, most national governments have resorted to unprecedented measures that severely curtail individual liberties. These include "lockdowns", in which people are required to remain within their homes except for limited purposes such as grocery shopping, and social distancing requirements within public venues. The main objective of these is to "flatten the curve" of COVID-19 infections, spreading the numbers of individuals who catch the virus and require hospitalization over a longer period so that health systems can cope with demand, while also allowing more time for the development of vaccines and other treatments and the steady build-up of population-level immunity to the virus (Hannigan et al., 2020). How information is conveyed to the public about these measures and about how to protect themselves from the virus are likely to influence their attitudes and behaviors in ways that affect their risks of infection, their likelihood of spreading the virus to others if they catch it, and their willingness to comply with government requirements. However, the public is also exposed to a wide range of information about the pandemic, especially from social media and other online sources, which is not necessarily authoritative or accurate but can influence

their attitudes and behaviors in ways that might jeopardize the efforts of the authorities to manage the pandemic and reduce the rate of infection (Starbird et al., 2020).

RESEARCH OBJECTIVES AND QUESTIONS

A considerable number of research-based articles were published in the first half of the year 2020, which have explored various aspects of the role of information in influencing attitudes and behavior relating to COVID-19. The objectives of the current article are:

1) To summarize and discuss by the main findings of this body of research by key themes.

2) To draw out the practical implications of these findings for the management of information in a global pandemic.

To achieve the research objectives, the paper addresses the following specific research questions: 1) What important insights are provided by existing literature on the role of information in influencing public attitudes and behaviors in a global pandemic?

2) What are the practical implications of these insights for the current and future management of pandemics or epidemics?

REVIEW OF LITERATURE

The links between information, attitudes, and behaviors have long been established and set out in theories and models such as Azjen and Fishbein's (1980) Theory of Reasoned Action, Azjen's (1991) Theory of Planned Behaviour, and Hochbaum, Rosenstock, and Kegel's (1952) Health Belief Model. Although the specific components of these theories and models differ, they mostly have in common the recognition that to change their behaviors, individuals need information or knowledge about the likely benefits of doing so, whether these are personal or social benefits. Information in itself is rarely sufficient to have an impact on behavior, however – most of these behavioral theories and models also acknowledge that individuals must also be personally motivated to carry out or change a behavior. For example, Fisher and Fisher's (1992) Information-Motivation-Behavioral Skills Model shows how individuals may change their health-related behaviors if they believe they are well-informed about the benefits of doing so, are motivated to do so, and believe they have the behavioral skills required. Researchers have distinguished between two forms of motivation: intrinsic and extrinsic. Intrinsic motivation is derived from the enjoyment or sense of satisfaction that individuals can achieve directly from performing a specific behavior or task, or from the sense of obligation or responsibility to perform it. Extrinsic or external motivation is derived from the expectation of an external reward as a result of performing the task or behavior, such as payment for work, or gaining the respect, approval, or praise of others (Deci & Ryan, 2008). Extrinsic motivation is a key element in Ajzen and Fishbein's (1980) Theory of Reasoned Action, which proposed that the intentions of someone to perform a behavior are influenced by what they believe others will think of the behavior. This helps explain why, as Azjen, Joyce, and Cote (2011) pointed out, the accuracy of the information held by individuals is relatively unimportant in predicting their behaviors; what is more important is the subjective information or beliefs that they hold about the likely outcomes of certain behaviors and the expectations or norms held by individuals or groups important to them which relate to these behaviors. Similarly, the Health Belief Model, developed by Hochbaum, Rosenstock, & Kegels (1952), originally included four main factors believed to influence the likelihood of carrying out health-related behaviors: Perceived Susceptibility, Perceived Severity, Perceived Benefits, and Perceived Barriers. Later versions of this theory incorporated two further factors: Self-Efficacy and Cues for Action. Cues for Action are similar to intrinsic and extrinsic motivations, with the latter including information provided by sources trusted by the individual, such as friends, health professionals, or the media (Becker, 1974; Rosenstock, Strecher, & Becker, 1988).

A limited body of empirical research conducted prior to 2020 addressed the role of information in influencing public attitudes and behaviors in a pandemic situation. For example, Zhang, Wang, Zhu and Wang's (2020) research conducted in China in 2018 used regression analyses to examine how attitudes (ATT), subjective norms (SN), and perceived behavioral control (PBC) influence the likelihood of self-isolating (SI) in the context of an influenza pandemic emergency. All three independent factors were found to significantly predict SI. The researchers concluded that extensive publicity is needed by local governments and the media to raise residents' awareness of the pandemic risks, to improve the social norms relating to public health, and to raise self-efficacy through an improved understanding of how to reduce personal risks. Several other articles were identified in a literature review on infection prevention behavior and infectious disease modelling conducted by Weston, Hauck, and Amlôt (2018). For example, Funk, Gilad, Watkins and Jansen (2009) found evidence that an individual's level of awareness and the consequent risk of infection is influenced by the number of individuals that information passes through until it reaches them. Other researchers have highlighted the role of the media and other external sources of information in influencing the likelihood of performing health-protective behaviors (e.g. Durham & Casman, 2012; Guo, Li, Peters, Snively, Poehling, & Zhou, 2015). Tang, Bie, Park, & Zhi (2018) carried out a systematic review of previous literature on the social media in providing information during outbreaks of infectious diseases, and found three main themes in this literature: public's interest in and responses to emerging infectious diseases (EID) on social media;

examination of organizations' use of social media in communicating information about EIDs, and assessment of the accuracy of EID- related medical information on social media.

In the context of a pandemic, understanding the links between information and behaviors and the factors influencing these is especially important, since the collective behaviors of the public will influence the effectiveness of any measures taken to contain the pandemic and limit its impacts. Many people now rely heavily on social media and other unofficial news sources, and this presents challenges for local or national governments in terms of ensuring that people receive information that will help promote positive behaviors that support rather than hinder pandemic management measures and strategies.

METHODOLOGY

The research is based on a thematic review of academic literature relevant to the influence of information on public attitudes and behaviors in a global pandemic, published during the global spread of COVID-19 in the first six months of 2020. Articles published in 2020 were identified from academic research databases and online search engines using combinations of the key search terms "COVID-19", "coronavirus" "information" and "social media". Initially, the abstracts of articles generated by these searches were scanned to determine whether they were relevant to the study. Having discarded those not relevant, a total of 22 articles were included when the research was originally carried out in April 2020. Because this was a rapidly evolving field, the searches were repeated again in July 2020 and generated an additional 13 articles, which were included in the study.

The research was intended to quickly capture and discuss the key themes arising from this body of research, in order to ensure that these are readily accessible and understandable in a timely way to a range of audiences including policymakers as well as academic researchers. As such, the study is not claimed to be a comprehensive or systematic review of the literature in this area. However, attempts were made to identify as many articles as possible relating to the issue of information and COVID-19, and the clear search terms and limited time period made this relatively straightforward. The article takes the form of a narrative review (Sylvester, Tate, & Johnstone, 2013), which summarizes and syntheses the key information on a particular topic (Paré & Kitsiou, 2017) for the purpose of providing background and an up-to-date overview of research in this area (Green, Johnstone & Adams, 2006).

Relevant content was extracted from each article and organized manually into several key themes, which have been used to organize the Findings section of the article. Within each of these, the key points from the literature are synthesized and discussed and the implications for pandemic management are highlighted.

FINDINGS AND ANALYSIS

Importance of information in helping to contain a pandemic

The reviewed literature highlights the very important role of information in educating the public about how to protect themselves against COVID-19 and help limit the spread of the virus. It is especially important in ensuring that vulnerable groups are aware of the various healthcare-related and social supports available to them. These include, for example, information about procedures to follow in the event of COVID-19 symptoms (Susilo, 2020) and community-level or neighborhood-level information about volunteers offering assistance with grocery shopping or collecting medication. Rosenberg, Syed, & Rezaie (2020) highlight the important role of Twitter and other social media platforms in rapidly disseminating inspirational human stories about individual and community-level efforts to help others during the pandemic, thus providing emotional support and encouragement to those struggling to cope with the crisis. Social media also plays a particularly important role in the dissemination of information during a pandemic, not only because it is already so widely used as a source of information and news, but because lockdowns and social distancing requirements have reduced the opportunities for personal interaction with others (Chen, Lerman, & Ferrara, 2020).

Nazir, Hussain, Tian, et al. (2020) conducting survey research in Pakistan during the early months of the COVID-19 pandemic, found that social media influences preventative behaviours, through the mediating factors of increased awareness and information exchange. An editorial by Ågerfalk, Conboy & Myers (2020) highlighted how information systems provide stakeholders, including the public, with the data needed to understand the pandemic and how to respond to it.

Indeed, the available research findings to date indicate that during the COVID-19 pandemic, people have been seeking out more information than they usually would. This is not just related to the virus itself; Fetzer, Hensel, Hermle, & Roth (2020) found evidence of increased online searches for information indicative of raised levels of economic anxiety due to the pandemic. However, there is also evidence that increased information-seeking may be helping to raise awareness and understanding of the virus and protection measures, which are in turn helping to limit the spread of the virus. For example, an international survey conducted in six countries (Argentina, Germany, South Korea, Spain, the UK, and the US) in March and early April 2020 (Nielsen et al., 2020) revealed that news usage in general increased at that time, with the majority of respondents in each country using social media, search engines, video sites, and messaging applications to obtain

information about COVID-19. Most respondents also indicated that the news media had helped them to understand the virus and what to do to protect themselves against it. A regression analysis of the survey data confirmed that the use of news organizations was associated with a significant increase in COVID-19 knowledge among respondents in every country (Nielsen et al., 2020). This survey did not explore the extent to which such knowledge translated into behaviors that would help limit the spread of the virus; however, an econometric analysis conducted in China indicated that, after controlling for other factors, the dissemination of information about the virus and self-protection measures helped limit the spread of COVID-19 in China, suggesting that increased knowledge about the virus was positively influencing public behaviors, at least in this setting (Shanlang et al., 2020).

However, the international survey conducted by Nielsen et al. (2020) also revealed that there were differences within the populations surveyed in terms of the accuracy of their knowledge about the virus. These seemed to be associated with the types of information sources used. The highest levels of accurate knowledge were demonstrated by individuals with higher levels of education who were using a wide range of information sources, but who indicated lower levels of trust in social media, video platforms, and messaging applications and greater trust in news organizations. People with lower levels of education and those in the younger age groups were more likely to be using social media as their main source of information, which suggests that national governments and health authorities should be using this channel extensively to ensure that accurate and reliable information reaches all segments of the population. Indeed, authorities such as the World Health Organisation and many national health authorities are already using social media to disseminate information about COVID-19 to the public, to reach those who might not use more traditional news channels such as newspapers or radio (O'Brien, Moore, & McNicholas, 2020), but there is likely to be a need for more extensive use of digital information sources in managing the pandemic.

Potential negative impacts of information on attitudes and behaviors

Although accurate information is important in increasing public awareness and influencing behaviors in ways that help control the spread of COVID-19, the available literature also highlights the potentially negative effects on individuals and populations when receiving too much virus-related news content or information that is released in an untimely way. At the individual level, watching multiple news broadcasts about the virus throughout the day or constantly scrolling through social media posts about the virus can increase levels of anxiety and perceived risk, and lead to unhelpful behaviors such as seeking unnecessary GP or hospital care, thus placing unnecessary pressure on already overburdened health systems (O'Brien et al., 2020).

At the community and national levels, excessive media coverage of information relating to the virus can create unnecessary levels of panic which translate into behaviors such as panic buying and hoarding of food and other essential items. These have knock-on effects on supply chains and can ultimately disrupt the effective operation of the economy or the healthcare system - for example when panic buying of protective equipment such as face masks results in a shortage of these for healthcare workers or more vulnerable individuals (Nicomedes & Avila, 2020; O'Brien et al., 2020; Tasnim, Hossain & Mazumder, 2020). Social media has exacerbated these risks because content can be shared and disseminated very rapidly on these channels. As an example, Yin et al. (2020) reported an exponential increase in coronavirus-related posts on China's Sina-microblog (Weibo) after a Chinese expert in infectious diseases first posted about human to human transmission in January 2020, which then resulted in a massive surge of demand for and shortage of personal protective equipment such as surgical masks.

Traditional news media can also disrupt the management of the pandemic. This has occurred when TV news channels have released information in an untimely way, thus provoking behaviors that potentially undermine the effectiveness of national measures or have other adverse health-related or economic impacts (Shanlang et al., 2020). Cinelli et al. (2020) cite the example of CNN, which reported an anticipated lockdown in the north of Italy before this was officially announced by the Italian government. This resulted in a mass exodus of people from the region and caused overcrowding of public transport and main routes, and also undermined the Italian government's attempts to contain the virus and prevent its spread to other parts of the country.

Fake news and misinformation

While social media is one of the main sources of information about COVID-19 for many people, considerable amounts of misinformation and "fake news" are also spread on these networks (Cinelli et al., 2020). In an analysis of a sample of 673 COVID-19 related tweets posted on Twitter on a single day in late February 2020, Kouzy et al. (2020) found that 24.8% included misinformation and a further 17.4 included unverifiable information, with these mostly being from unofficial or personal social media accounts. To investigate the types of false information being posted on social media about COVID-19, Brennen, Simon, Howard, and Nielson (2020) analyzed a sample of 225 pieces of social media content that had been already been rated as false by fact-checkers. They found that most of these involved "reconfiguration" or "twisting" of existing information much of which was originally accurate, while 38% of the sample consisted of content that was completely

fabricated. Cuan-Baltazar, Muñoz-Perez, Robledo-Vega, Pérez-Zepeda, & Soto-Vega (2020) determined, using Google algorithms, that many other websites used by individuals when searching for information about COVID-19 were not verified. According to research by Laato, Islam, Islam, & Whelan (2020) people often share unverified and or fake information because of a lack of critical thinking skills and a misplaced trust in online information.

The spread of false information and misinformation on social media is particularly problematic in the case of a new virus such as COVID-19. This is because there is still a relative lack of scientific knowledge about how the virus operates and this makes it difficult for people to distinguish between correct and false information (Limaye, 2020). This can place the public at risk, for example when home-grown remedies that may themselves cause illness or death are recommended as cures for the virus, or when those affected by the virus are deterred from seeking proper healthcare. During the COVID-19 pandemic, this happened when the information was circulating on social media about the use of chloroquine as an effective treatment (Limaye et al., 2020; Starbird, Spiro, & Koltai, 2020). Misinformation or "disinformation" circulating on social media which can undermine official policies and strategies to manage the virus also includes conspiracy theories about the origins of the pandemic, or attempts by opponents of ruling governments to use the crisis for their own political gain (Starbird et al., 2020). Tasnim, Hossain, and Mazumder (2020)) also point out that that false information on social media can promote a sense of perceived social stigma about the virus, which might deter those who are infected from self-isolating and thus lead to the further spread of the virus.

Compared with more conventional information channels such as newspapers, television, and radio, there are few established procedures for verifying the accuracy of social media content before it is released (Limaye et al., 2020). Unreliable or dangerous content can quickly spread around the world on these networks, and influence the beliefs and actions of vast numbers of people in ways that might be harmful to themselves or their communities or might threaten the effectiveness of official COVID-19 prevention strategies. Warning in early 2020 of a misinformation "infodemic", the World Health Organization (WHO) has been attempting to address this by monitoring and responding to inaccurate rumors and myths about the coronavirus as well as using a range of social media networks to post officially verified information (WHO, 2020). The WHO has also implemented an official information network to share information about COVID-19 with specific groups, and a communications team that monitors social media networks and online search engines and attempts to ensure people are directed to official information sources (Zarocostas, 2020). However, competing with the viral spread of sensationalist posts is challenging. As Starbird et al. (2020) observe, misinformation generally spreads much faster and further than accurate information, and it is important that this is rapidly identified and corrected by the authorities.

Mian and Khan (2020) observed that in the early months of the pandemic in 2020, official online posts from the WHO and the US Center of Disease Control (CDC) were only visited by a few hundred thousand people, compared with more than 52 million who visited sites in which conspiracy theories and other fake news were posted. It is notable that in Nielsen et al.'s (2020) survey of respondents in six countries, around a quarter of all respondents incorrectly believed the virus had been developed in a laboratory. Pennycook, McPhetres, Zhang, and Rand (2020) conducted an experimental study involving more than 1600 participants in the United States. They found that people often share false information about COVID-19 because they fail to consider whether it is accurate before doing so. The researchers also found that individuals who have a greater knowledge of science or are more analytical thinkers are more likely to consider the accuracy of social media content before sharing it.

However, it is not only on social media that misinformation about the coronavirus is being propagated. TV channels and newspapers also often discuss issues in ways that exaggerate or distort the true situation, sometimes for political reasons and sometimes just for sensationalism (Limaye et al., 2020; Mejia et al., 2020). In Nielson et al's (2020) survey of the public in six countries around the world, roughly a third of respondents on average believed they had come across a lot of false or misleading information about the virus in the previous week on various official and unofficial channels, with politicians being one of the main sources of this perceived misinformation. Irresponsible actions by the media in some countries, such as referring to COVID-19 as the "China virus" or "Wuhan virus" (Ren, Gao, and Chen, 2020), have contributed to negative public attitudes such as xenophobia and prejudice, and behaviors involving discrimination or abuse not only against Chinese people but others of non-Chinese Asian appearance (Depoux et al., 2020; Nicomedes & Avila, 2020; O'Brien et al., 2020; Tasnim, Hossain & Mazumder, 2020; Ren et al., 2020; Zheng, Goh & Wen, 2020).

The important role of key influencers

The reviewed research revealed the importance of what can be referred to as "key influencers" or "trusted sources" (Hannigan et al., 2020) in the information dissemination process. These are highly respected or influential individuals who play a key role in disseminating information, especially in times of crisis. In a pandemic, these include health specialists. Nielsen et al.'s (2020) six-country survey findings revealed that very high numbers of respondents viewed scientists, doctors, and other health experts as trusted sources of information about COVID-19. They were rated higher in terms of trustworthiness than public health organizations, news organizations, and national governments. Indeed, health professionals,

in general, are an important and trusted source of information and are often able to influence the attitudes and behaviors of individuals by reducing their anxiety levels about the virus (Mejia et al., 2020).

However, individuals also seek information from other "trusted sources" who might not themselves be knowledgeable about the virus or might pass on inaccurate information. These include the individual's own family and friends (Mejia et al., 2020), high-profile public figures, or established social media influencers. They often represent key nodes in well-established patterns of communication such as the informal "grapevine" that exists within communities (Hannigan et al., 2020), and their level of influence on public attitudes and behavior can be highly disproportionate to their levels of knowledge and expertise. In their analysis of 225 pieces of misinformation or false information posted between January and March 2020, Brennen et al. (2020) found that content posted by prominent public figures such as celebrities and politicians accounted for just 20% of the posts, but 69% of overall social engagement. Being seen as authoritative sources of information, the information posted by key influencers is often shared and disseminated widely. This further increases its perceived legitimacy as well as its potential impact on the attitudes and behaviors of those exposed to the information. Although this can influence the attitudes and behaviors of their followers in negative ways, the effects can also be positive and helpful for the management of the pandemic. For example, according to O'Brien et al. (2020), the personal accounts of coronavirus posted by celebrities and other high profile figures may be helping to "demystify and destigmatise" (p.52) the disease and reduce public anxiety. Giuliano and Rasul (2020) found evidence from their review of other recent studies that perceptions of the virus are often influenced by whether the person from whom information is received has similar political beliefs to the recipient.

Given the influential role of such influential individuals and the risks involved when they inadvertently spread misinformation, it seems important that governments and other official bodies should identify and utilize such individuals within their information management strategies. For example, they might seek to disseminate information via community leaders or other individuals admired or esteemed within particular communities (Hannigan et al., 2020), or use high profile celebrities or other public figures in media campaigns intended to educate the public about protection from the virus. Since frontline healthcare providers also form trusted sources of information about the virus, governments need to ensure that these have access to reliable and accurate information to pass on to the public and their patients (Tasnim et al., 2020)

In the case of social media, however, new patterns of communications and information dissemination are developing in which individuals have been able to attract thousands or even millions of "followers" to their accounts, and who potentially, therefore, have a major influence on these followers if posting content relating to COVID-19. Indeed, researchers are finding that in the context of this pandemic, information from these unofficial sources is disseminated far more widely than official content from sources like the WHO. Li et al (2020) analyzed a sample of posts from Weibo, China's main microblogging site. They found that nearly all types of COVID-19-related content posted by non-verified sources was reposted more often content posted by verified users. This indicates that authorities may need to develop new information dissemination strategies that utilize the accounts of these social media influencers, in order to ensure these go "viral" and are not overshadowed by the mass of non-verified information about COVID-19 that is being posted online. Bikbov and Bikbov (2020) highlight the importance of using key influencers and other influential people in a network to help ensure that government messages go viral, whether or not this is on social media or within more traditional communications networks.

The responsibilities of tech and social media companies

Based on their findings that social media users often share false information because they fail to consider its accuracy before doing so, Pennycook et al. (2020) argued that social media networks should take responsibility for encouraging social media users to be more thoughtful to reduce the spread of inaccurate information. Tasnim et al. (2020) note that it is the responsibility of tech and social media companies to detect and remove fake news. Indeed, these networks have begun to introduce measures such as greater regulation of content and the use of crowd-sourcing for the identification of false information (Limaye et al., 2020). However, Limaye et al. (2020) suggest that other measures are also needed which prioritize links to legitimate health authorities on social media networks and online search engines. Since mid-April 2020 Facebook has begun to take this approach by directing users to a World Health Organization "myth busters" page when they like, share or comment on posts that have already been identified as containing misinformation that could contribute to "imminent physical harm" but which have not yet been removed by the network (The Guardian, 16th April 2020). However, Brennan et al.'s (2020) analysis of misinformation and false information found that even after posts had been rated as false by fact-checkers, 59% remained on Twitter, 27% on YouTube, and 24% on Facebook, indicating that much more needs to be done to manage the spread of misinformation on social media.

The WHO has already partnered with social media and tech companies to help ensure that accurate information is being disseminated on their networks (Tasnim et al., 2020) and has implemented a WhatsApp-based Health Alert Service to convey up-to-date and accurate information about COVID-19 to citizens worldwide (Bikbov & Bikbov, 2020). However, it has been argued that more strategic partnerships of this type are needed (Tasnim et al., 2020) to influence public attitudes and behaviors in helpful ways during the COVID-19 pandemic. Limaye et al. (2020) suggest that these might take the form

of an "inoculation" strategy intended to strengthen attitudes and knowledge about the virus and protect the public from harmful misinformation.

Tailoring official information to target groups

A final key theme identified from the review of recently published literature relates to the importance of ensuring that information about the COVID-19 virus and prevention measures is disseminated in ways that are carefully tailored to the objectives of the communication and various groups.

Hannigan et al. (2020) note the importance of achieving the right balance between reducing anxiety and building compassion, while also building long-term adherence to prevention measures and promoting sustainable behavioral changes that will not only reduce initial numbers of infections but the likelihood of subsequent peaks. They argue that it is important to take into account the cultural filters through which information is processed and understood at the community level, as well as the patterns of interaction that exist at this level, when planning and executing communications strategies. These differences even exist between different social media networks. In a comparative analysis of posts on Twitter, Instagram, YouTube, Reddit, and Gab during the early COVID-19 outbreak in Italy, Cinelli et al. (2020) found evidence of differences in the group dynamics of users which led to different patterns of information dissemination between these networks. Any social media campaign initiated by governmental or healthcare authorities to influence public attitudes and behaviors concerning the coronavirus will need to take these types of differences into account to maximize their effectiveness.

Early evidence is also emerging of specific information dissemination methods or strategies that are proving to be effective in changing behaviors, either in the context of the current pandemic or other public health situations. For example, Haushofer and Metcalf (2020) report on the effectiveness of various "light-touch" methods that remind the public to carry out health prevention routines or promote psychological effects that increase adherence to these. Their cited examples from previous literature include text messaging used to improve adherence to antiretroviral drug use in Kenya, and emotional messaging that improved hygiene through increased hand-washing in India. Countries that had early success in containing the COVID-19 virus, such as Taiwan and South Korea, used text messaging strategies in a similar way (Bikbov & Bikbov, 2020). These types of light-touch communication strategies are argued to be especially important for vulnerable groups such as those with low levels of health literacy, refugees, migrant workers, people in care homes and assisted living, prisoners, and individuals with learning disabilities (Bikbov & Bikbov, 2020).

Usman et al.'s (2020) study into how female rural market vendors in Uganda obtain their information about the COVID-19 pandemic found that the majority of the research participants were relying on a single source of information but had moderate levels of COVID-19 awareness, and that knowledge was associated with preventative practices. The researchers attributed the market vendors' knowledge largely to the awareness campaigns being conducted online by the government but recommended that improved information strategies be implemented to reach rural populations more effectively.

PRACTICAL IMPLICATIONS OF THE FINDINGS

Overall, the key insights from recent literature that have been discussed within specific themes above have several important practical implications. These have been touched on within the discussion of themes but are summarized here.

First, the literature has revealed that the public relies on a wide range of official and unofficial information sources in a pandemic situation. There is evidence that this is influencing their attitudes and behaviors in ways that can either be effective in limiting the spread of the virus or may undermine the attempts of governments to manage the pandemic. Some demographic groups, such as younger people and those with lower levels of education, appear more likely to obtain coronavirus-related information, which is largely unverified, from sources such as unofficial social media networks. Since large amounts of fake news and misinformation are circulating on social media networks, it seems important that official organizations and authorities, including health organizations, local and national governments, establish a strong presence on these to help counteract these with accurate and reliable information, and should collaborate with social media and tech companies to limit the spread of false information. The findings of the reviewed literature also highlight the importance of working closely with conventional news media to ensure that the public is not misled or confused by conflicting or inaccurate information that undermines national COVID-19 strategies or that encourages negative attitudes or behaviors such as discrimination against particular ethnic groups. Around the world, national and local or state governments should take steps to ensure that the public is exposed to accurate information that encourages the development of attitudes and behaviors that support national strategies for preventing the spread of COVID-19, not just in the immediate context but in the longer term. Social media platforms such as Twitter and Facebook should play a big role in the dissemination of this official information since many individuals rely on this as their main or only source of information and news about the pandemic, and in order to counter-balance and help correct the vast amounts of fake news and misinformation circulating on these platforms. However, official information needs to be disseminated using a range of channels including television and radio news and print media in order to effectively reach all groups within the population. In the case of rural or remote areas where

telecommunications infrastructure and Internet access may be limited, especially in less developed countries, health organizations and governments need to evaluate and if necessary strengthen their information dissemination strategies to ensure these are effectively reaching all target populations.

To maximize their potential impact, communications about the virus and related government policies should also be carefully designed and disseminated in ways that take into account demographic, educational, and cultural differences within populations. Key individuals such as community leaders, celebrities, and social media influencers, who represent trusted sources of information for their communities, fans, or followers, can play an important role in conveying information in ways that have a positive influence on attitudes and behaviors, such as adherence to social isolation or social distancing requirements. Light-touch measures such as text messaging might also be helpful in influencing attitudes and behaviors among some vulnerable groups or those whose consumption of news media is low, or in reinforcing health protection routines such as frequent hand-washing.

CONCLUSION

At the time of writing, the COVID-19 coronavirus pandemic is an ongoing situation affecting virtually all countries of the world. Ultimately, it is the collective behaviors of the public that largely determine the effectiveness of national COVID-19 policies and strategies, and these are influenced by the knowledge, beliefs, and attitudes that individuals hold. Therefore, information dissemination is a key tool in efforts to limit the spread of the virus. Effective information dissemination is essential not only to educate the public about the measures required of them but also to counteract any negative influence of misinformation and fake news on public attitudes and behaviors. The COVID-19 pandemic is providing a new opportunity to understand how information influences public attitudes and behaviors in a global health crisis, within the context of a largely digital information environment. The insights from emerging literature in this area which has been summarized thematically in this paper are expected to be of interest to policymakers, healthcare practitioners, and academic researchers alike, and will provide a foundation for further theoretical and empirical research into the links between information and health-related behaviors.

STUDY LIMITATIONS

The study has two main limitations. The first that it may have omitted some articles which meet the search criteria. Although the researchers attempted to identify as many relevant studies as possible from leading research databases and research engines, the search methods were designed to identify key themes in the emerging literature in a timely way and not to identify every relevant article. The second main limitation is that most of the research was conducted during the early months of a prolonged and evolving global pandemic. Many additional studies have likely been published since then which provide further insights into the thematic areas identified in this review, or contribute important new themes to the body of knowledge in this area. It is recommended that further literature reviews and syntheses of research findings are carried out to provide a further theoretical and practical understanding of the role of information in influencing public attitudes and behaviors in a global pandemic.

AUTHORS CONTRIBUTION

1. **Mohammed Nasser Al-Suqri** (Abstract, Research Objectives, Research Questions, Findings, Practical Implications of the Findings, Conclusion).

2. **Jamal Mattar Al Salmi** (Introduction, Literature Review).

3. **Aayda Mohammed Al Shabibi** (Methodology, Reference Formatting).

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