ORIGINAL RESEARCH

Using WhatsApp During the COVID-19 Pandemic and the Emotions and Perceptions of Users

Ruba AbdelMatloub Moawad 🆔

Psychology Department, King Saud University, Riyadh, Saudi Arabia

Correspondence: Ruba AbdelMatloub Moawad, Email ramoawad@ksu.edu.sa

Background: Social media is an integral part of daily life as people are exposed to considerable amounts of information via social media. In particular, WhatsApp is a messaging application used for sharing information and keeping in touch with individuals and groups. It is a platform considered appropriate for expressing emotions.
Purpose: This study analyzed a WhatsApp group of friends in Saudi Arabia and their messages regarding the coronavirus disease 2019 (COVID-19) pandemic during the first wave of infections to capture their attitudes, emotions, and perceptions related to the pandemic. We also investigated WhatsApp usage during COVID-19.
Methods and Participants: A quantitative exploratory study and qualitative content analysis of a sample of WhatsApp group interactions during the pandemic in Saudi Arabia were combined.
Results: We found that WhatsApp was used more frequently than other social media platforms for communication with family and friends. Moreover, denial was the first behavior evident at the beginning of the pandemic, followed by hope, sadness, and anxiety, and then, panic, fear, and happiness.
Conclusion: WhatsApp affects its users' attitudes, perceptions, and behavior just as much as any other social media. Posts and comments shared on WhatsApp reflected different emotions, ranging from fear, anger, and sadness to hope, happiness, and pride.
Keywords: COVID-19 pandemic, emotions, perception, social networks, WhatsApp

Introduction

People are exposed to vast amounts of information through different social platforms. Individuals can collect and share information through these platforms at unprecedented speeds, influencing both their lives[1] and decision-making,[2] as such platforms can disseminate information faster than conventional websites.[3]

Individuals generally use social media to stay in touch with friends and family, while some post, search, and share information through it. Females generally use social media for information sharing in different situations compared to males.[4] A problem with social media is the spreading of false or fabricated information that can harm others, cause hysteria, or make people disregard accurate information presented on various social media platforms.[5] Inaccurate or misinformation can evoke unwanted emotions, such as confusion and anxiety, which can subsequently motivate individuals to share incorrect information with others on social media.[6]

Social Media and Pandemics

Comments on social media reflect people's thoughts and interests.[7] They are usually affected by news and content posted on social media. Particularly, comments offer some insight into individuals' perspectives, as witnessed during the 2009 H1N1 pandemic, when comments had a significant role in influencing people's decision-making, opinions, and perspectives.[7]

Diseases that are highly discussed in the media are perceived as more serious than ones with a low frequency of discussion.[8] Furthermore, negative tweets are associated with higher stress, and high levels of fear are associated with a greater frequency of negative tweets. Positive emotions, however, are associated with tweets reflecting happiness. Thus, data and posts on social

media can influence individuals' well-being, and social media platforms can help predict stress levels and emotional states.[9] Notably, individuals' attitudes toward social media are generally positive, even in the case of medical issues.[10]

Coronavirus disease 2019 (COVID-19) is the latest pandemic that has disrupted the world. On December 31, 2019, this novel disease was first identified in Wuhan, Hubei Province, China. On January 10, 2020, the World Health Organization (WHO) issued technical guidelines, advising countries on how to detect the disease and manage potential cases. On March 11, COVID-19 was characterized as a pandemic.[11] After COVID-19 started spreading around the globe, many people used social media to share information. Some materials and posts were inaccurate. However, most information was reliable and practical, especially when shared on popular social media.[12]

On the one hand, social media had a vital role in managing communication and operations during the pandemic among university employees in the Philippines,[13] and helped to disseminate medical information much faster than what was possible 30 years ago.[14] On the other hand, academicians found that social media was employed as a platform for spreading conspiracy theories during the Arab Spring and the initial release of WikiLeaks in 2010, as well as in 2020 when conspiracy theorists on Twitter linked the COVID-19 pandemic to the 5G cellular network.[15] It was even suggested that the virus accidentally escaped or was even deliberately released from a Chinese biological weapons laboratory. This rumor was closely related to the 5G conspiracy theory. According to another conspiracy theory, the COVID-19 pandemic is a hoax and poses no significant threat other than economic damage caused by stay-at-home restrictions. Bill Gates and his foundation were also placed center stage in conspiracy theories involving global vaccination and surveillance.[16] Many social media conspiracies are discussed on different platforms and messaging applications.[15]

The emotions expressed in social media differ according to the platform's purpose. Negative emotions appear more frequently due to the need for socialization and information sharing about events and updates. Conversely, positive emotions are identified with entertainment and information related to products, services, ideas, and inspirations.[17] The expression of negative emotions has been rated appropriate for WhatsApp, followed by Facebook, Twitter, and Instagram. Moreover, the expression of positive emotions is more appropriate for WhatsApp, followed by Instagram, Facebook, and Twitter.[18]

Social Media and Information Dissemination

As the use of social media platforms rose, people obtained information from more than one source. However, the sources are not always professional but do have a strong presence online (eg Twitter and WebMD). Accordingly, such media can influence people by communicating messages.[19] If used properly, health communication can help protect public health through proper planning and education. Such forms of communication can maximize awareness and peoples' adaptability to changing circumstances, particularly when health plans are made from the perspective of a targeted group and are relevant to their needs.[20]

Many people employ multiple messaging applications to communicate with family members and friends. Several applications permit and support cross-application conversations, enabling users to send and receive messages. Each messaging application fulfills a specific communication role; for instance, people choose a certain application according to their experience with it.[21]

WhatsApp as a Social Media and Messaging Application

WhatsApp is a popular messaging platform for sharing information and keeping in touch with individuals and groups.[22] It is an instant messaging application available on smartphones and employs the Internet for communication, allowing users to send images, videos, and audio media in addition to their location,[23] while maintaining privacy.[24] WhatsApp accounts for a large proportion of typical daily smartphone use.[25] Many people believe it is an appropriate platform to express feelings and emotions.[18] Hence, WhatsApp helps shape decision-making, improves communication, and allows data to be sent to others,[24] especially essential information that can help resolve daily life issues.[26]

Females use WhatsApp more than males, and younger people tend to use it more than older ones. WhatsApp is apparently employed more than other messaging applications and social media, such as Facebook.[25] WhatsApp helps deepen friendships; it allows multiple participants to be added to a group, thus supporting a collective experience.[27] According to several journalists, WhatsApp is a fast way of circulating information. Ordinary citizens report incidents and news to the media before any reporter. A partnership has developed between ordinary people and media channels.

For instance, citizens may record a video of an event on the spot and send it to different media channels using WhatsApp. Therefore, it is a way of exchanging information and news immediately among groups.[28]

Pandemics and COVID-19

Throughout history, infectious diseases have resulted in the demise of countless humans. People's perception of and response to such risks and threats affect their decision-making during epidemics and pandemics.[29] During the SARS epidemic (2002–2004), people in infected areas mostly avoided public transport, which was perceived hazardous. Large gatherings of people at restaurants, entertainment facilities, hospitals, and stores were also regarded as risky, though regional variations were evident. Asian respondents reported that they were less likely to avoid restaurants and theaters and more likely to avoid doctor visits. European respondents indicated that stores and hospitals were riskier places and should be avoided.[30]

Cognitive variables during the swine flu (H1N1) pandemic generally showed low social sensitivity. However, a few key threat representations helped predict behavioral change, such as perceived control, understanding, and fear of disease. Thus, public information about infectious diseases is necessary to tackle inaccurate beliefs and help prevent diseases from spreading.[31] During the H1N1 pandemic, the content on Twitter observably changed over time. The public's attitude and behavior altered during the pandemic, and public concern and precautionary behavior increased when the threat of the outbreak grew and decreased when the perceived risk declined. Personal accounts of H1N1 increased with time, and the number of humorous comments fell. Besides, a large amount of misinformation was not even detected.[32]

Some measures have been adopted by various countries and organizations during epidemics and pandemics to curb the spread of diseases. Examples include school closures during the 1918, 1957, and 1968 pandemics in the United States (US), France, Hong Kong, and some Australian cities, which had some effect on the outbreak rate among children.[33] Implementing social distancing in Mexico during the H1N1 pandemic caused the outbreak to pause, but it did not stop the disease completely between waves.[34]

Social distancing is the practice of increasing the space between people by about two meters or more to decrease the chance of a disease spreading. In addition to working remotely and avoiding public transport, social distancing is one of the main measures recommended to decrease the spread of COVID-19.[35] Governments in most countries closed schools and educational institutions temporarily as a precautionary measure to prevent COVID-19 from spreading.[36] School closure likely reduces influenza transmission during outbreaks.[37] United Nations International Children's Emergency Fund (UNICEF) urges schools to provide children with vital information on how to protect themselves and their families against COVID-19. The International Federation of Red Cross and Red Crescent Societies, UNICEF, and the World Health Organization (WHO) issue guidance on protecting children and supporting safe school operations.[38]

During the COVID-19 pandemic, many people relied on social media and social messaging to acquire information and keep abreast with changes. Twitter posts allowed users to read about inspiring stories, global efforts on fighting COVID-19, and ideas and humorous ways of approaching medical quarantine.[5] Except for Twitter, people's activities on social media during emergencies and life-changing situations have generally been under-researched. Furthermore, Twitter is more accessible for research purposes than other social media and messaging platforms.[4] Whether accurate and reliable or incorrect and undependable, news and information spreading on social media and messaging platforms is dependent on the group dynamics of those engaged with the topic.[13]

The Present Study

This study evaluates the messages of a WhatsApp group of friends in Saudi Arabia concerning the COVID-19 pandemic to capture their attitudes, emotions, and perception with no reservations. This aspect is not possible on other social media because most other social media applications are open to the general public; therefore, individuals' interactions might not be as transparent as on WhatsApp. Moreover, we did not find a study investigating the emotions and attitudes of individuals on a private social media application such as WhatsApp. This research answers the following question: do WhatsApp messages and posts influence users' perceptions, emotions, and attitudes? This study also examined the use of WhatsApp during the pandemic. WhatsApp is the main social application used for communication among friends and family members in Saudi Arabia and is more popular than Twitter, Facebook, Instagram, and other social applications.[39]

Methods

This research combines a quantitative exploratory study and qualitative content analysis of a sample of a WhatsApp group's interaction messaging during the COVID-19 pandemic in Saudi Arabia.

Quantitative Study

This quantitative exploratory study intends to determine the utilization of WhatsApp as a social communication and messaging application during the COVID-19 pandemic in Saudi Arabia.

Participants

An electronic survey (in Arabic) regarding the use of WhatsApp as a social messaging application was sent as a link on WhatsApp, Instagram, Twitter, short message service (SMS), and as an email between June 1 to 20, 2020. Altogether, 1071 people responded to the survey: 799 females (74.6%) and 272 males (25.4%). Table 1 denotes the respondents' age groups. Among the respondents, 83% were university and higher education graduates and 95% were Saudis living in 42 cities and towns in Saudi Arabia and five other countries (ie Egypt, Ireland, Turkey, United Arab Emirates, and the United Kingdom).

Tools

A questionnaire was developed to obtain relevant information to better understand WhatsApp utilization. It constituted 24 questions, among which four questions obtained demographic data, 13 questions had a four-point Likert-scale answer (always, sometimes, infrequently, or never), five questions had a three-point Likert-scale answer (yes, no, or sometimes), and two questions permitted the participants to choose more than one answer. The survey was available as a Google Drive link on WhatsApp, Instagram, Twitter, SMS, and email. The questionnaire was sent to eight university academics (five at King Saud University, two at Princess Nura University, and one at Al-Imam University) with the face validity form so that its face validity could be tested. Overall, six members of our expert panel agreed that the questionnaire is valid at 90% according to its wording, clarity, and relation to the study. However, two of our experts suggested some changes to the wording of some questions, which was taken into consideration while finalizing the questionnaire.

Procedures

The questionnaire was available as a Google Drive link on WhatsApp, Instagram, Twitter, and SMS, and was also sent as an email. Individuals that were interested to participate answered the questionnaire and were also asked to forward it to family and friends if interested.

Results

With regards to the use of different social apps, where participants were allowed to select more than one app, the proportions of users were as follows: WhatsApp, 93% of respondents; Snapchat, 71%; Twitter, 58%; Instagram, 53%;

Table 1 Number and Proportion of Survey Respondents

Age-Group	Number	Proportion
18–25	95	8.9%
26–35	236	22%
36–45	337	31.5%
46–55	273	25.5%
56–65	116	10.8%
Over 66	14	1.3%

Facebook, 15%; and TikTok, 9%. Thus, WhatsApp was used more than any other application. The survey findings are summarized in Tables 2 and 3.

Participants were asked if they had downloaded the Saudi Ministry of Health application on their mobiles. Notably, 47.2% downloaded the appointment application, 40.6% downloaded the health application, 4% downloaded the health for doctor's application, and 39.5% did not download or follow any Ministry of Health applications during the pandemic. Some respondents, however, indicated that they downloaded or followed other health applications, such as Asefni ("help me"), Sehaty ("my health"), Zeyara ("visit"), Nabd ("pulse"), a WHO app, and the Ministry of Health's Twitter account and SMS.

We asked participants about moments when they began feeling anxious or worried about COVID-19. The highest proportion was 20%, witnessed after the announcement regarding the entry of infected people into Saudi Arabia (refer to Figure 1). Subsequently, this news led to the closure of schools and mosques, marking the beginning of the lockdown. The lowest percentages were seen when COVID-19 was first announced in January (4%) and when it spread to other countries, such as Italy and Spain (3%).

Qualitative Study

This qualitative study aimed to determine how a WhatsApp group of friends interacted after the COVID-19 outbreak in terms of their attitudes, emotions, and perceptions.

Data Collection

We assessed posts and messages of a WhatsApp group. The group consisted of 12 Saudi women aged 49–52 years, all university graduates. In particular, 10 participants had children studying in schools or universities in Saudi Arabia or

Table 2 Proportion of Responses on Four-Point Likert-Scale Answers

Response / Item	Always	Sometimes	Infrequently	Never
Use WhatsApp to communicate with family and friends	85.2%	13.2%	1.6%	0
Use WhatsApp to communicate with some officials	25.4%	34.6%	22.9%	17.1%
Use WhatsApp to share photos	40.9%	39.9%	14.3%	4.9%
Use WhatsApp to share light information and jokes	48.4%	38%	11.4%	2.2%
Use WhatsApp to share health information about COVID-19	28.6%	41.1%	18.2%	12.1%
Get latest information about COVID-19 from WhatsApp messages	17.1%	37.9%	20.4%	24.6%
Get updated information about COVID-19 from Ministry of Health Web site	60.6%	25.5%	7.1%	6.8%
Learn protection methods for COVID-19 through WhatsApp	20.2%	39.5%	18%	22.3%
Learn about curfew times during COVID-19 via WhatsApp	25.3%	36%	16%	22.7%
Learn of circulars about COVID-19 via WhatsApp	24%	37.7%	16.2%	22.1%
Confirm health information received via WhatsApp before resending it	69.8%	23.7%	3.6%	2.8%
Consider information received via WhatsApp reliable	2.4%	33.7%	33.1%	30.8%
Wear gloves and mask whenever I go out	83.3%	13.9%	1.6%	1.2%

Table 3 Proportion of Responses on Three-Point Likert-Scale Answers

| Response / Questions	Yes	No	Sometimes
Resend information from, eg, Twitter, Instagram about COVID-19 to my WhatsApp connections	25.7%	26.7%	47.6%
Follow WHO on WhatsApp to get latest news about COVID-19	10.5%	77%	12.5%
Ask everyone to wash their hands when entering the home	81.2%	4.9%	13.9%
Ask everyone to change their clothes when entering the home	33.8%	37.3%	28.9%
Follow health instructions to protect against COVID-19 inside and outside the home	92.2%	0.4%	7.5%
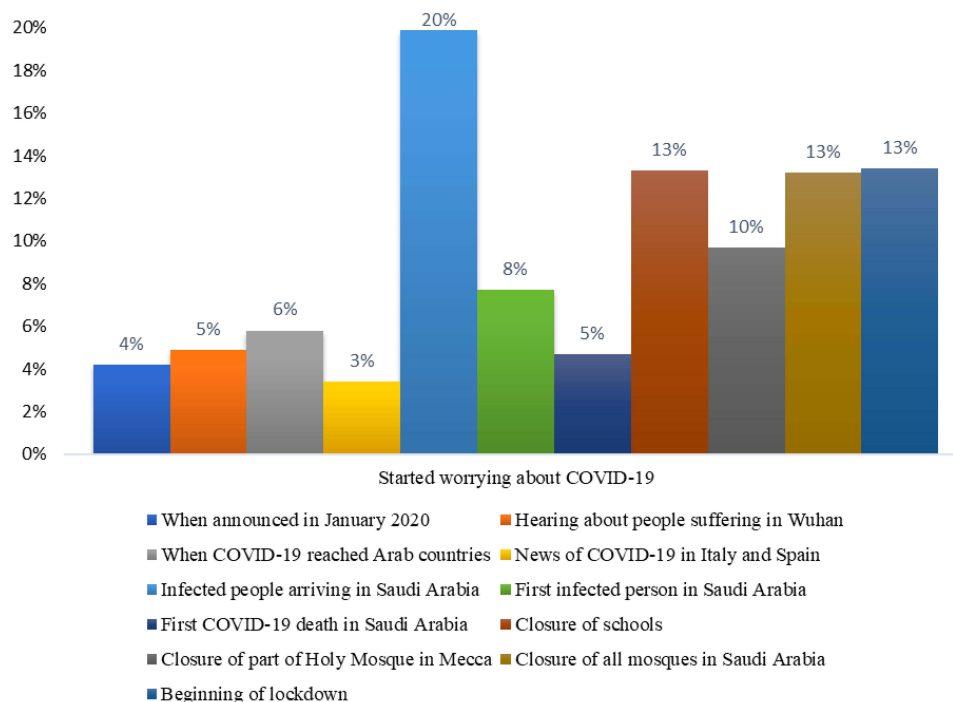
Figure 1 Proportion of responses about feeling anxious or worried because of COVID-19.

other countries. They had known one another since school. This group was chosen because the members interacted with each other on WhatsApp daily and felt comfortable discussing everything among themselves, including COVID-19 and everything related to it, with no reservations. All 12 of the participants gave their consent to participate and for their WhatsApp communications to be analyzed for this study.

Data Analyses and Results

A qualitative approach was followed to categorize the data obtained from our participants, whereby all messages were classified according to the type of message (reposted from different social media, humor, and topics and analysis), sentiments and prayers, and prevention measures for COVID-19 during the study time frame (ie January 28 to June 25, 2020 [the first wave of COVID-19]). We examined and categorized all messages and posts in the WhatsApp group about COVID-19 since the first message appeared in their messaging history (ie January 28, 2020).

After analyzing the group's messages and posts, a pathway of how the communications affected emotions, attitudes, and perceptions related to COVID-19 was identified (refer to Figure 2). Initially, all the posts shared from January 28 contained general information concerning the new disease and situation in Wuhan. The comments were mostly about doctors reporting the most affected groups, and the group was generally not happy with the situation.

A month later, on February 24, one post implied that the coronavirus was like a new plague. However, the number of infected people in other countries was still small. The Umrah (non-mandatory lesser pilgrimage made by Muslims to Makkah, which could be performed at any time of the year) to Makkah was halted by Saudi authorities to protect against the virus. However, most group comments denied any immediate danger.

The first rumor appeared in the group around the end of February. It was a post on social media about the commencement of school's final exams being held earlier than usual because of the virus. The following day, the rumor was discredited, and all group members agreed to rely on information from original sites, not posts from social media. On March 2, the announcement of the first case of infection in Saudi Arabia, together with the closing of the central main part of the Great Mosque in Makkah, was discussed among the group members. Overall, three emotions were noticeable. Hope was evident through comments and posts about the virus and infected people, with positive thoughts and prayers being relayed for the
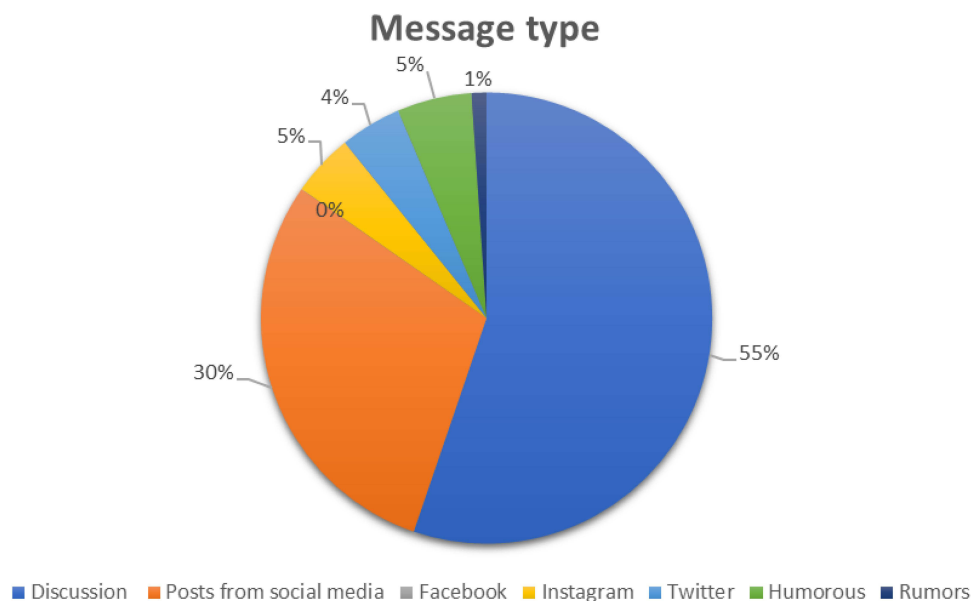
Message type

Figure 2 Proportion of message types.

infected. Sadness was also evident in the remarks and discussions because of the closure of the Great Mosque in Makkah. Lastly, pride was observable in relation to the government's intervention to protect the people.

On March 6, the closure of schools and universities generated anger. Infected people had entered the country without informing immigration officers about countries they had visited before entering Saudi Arabia. The change in emotion was due to the sadness caused by the virus, which was clear in the group's comments about schools' closure. This move was considered a major change, indicating the danger the virus represented. With the initiation of online learning, most of the mothers in the group were not happy with the new circumstances because they had to spend the whole day teaching their children.

Around mid-March, anxiety became prominent in the comments as the number of infected people rose. The members started discussing the importance of being cautious about everything related to the virus and how to avoid it for the first time. Anger became a common theme in their remarks as some people were not following the guidelines issued by the Ministry of Health. New posts appeared about making sanitizers and producing health guidelines in different languages.

Prayers started to increase in messages and notes, especially after the Friday prayers were halted in mosques. Posts about lockdown around the country started to trend, and panic was widespread. Many members were purchasing food and stocking their kitchens. The government announcements, however, reassured the people that food markets would not close, promising some relief.

Weeks after the school closure, children and their parents began feeling bored. Hence, posts about group games, exercises, and activities at home appeared in large numbers, and comments about daily goings-on were discussed. By the second week of April, a lockdown was implemented in Riyadh. Sadness and anxiety became very clear in the comments through the usage of tear and broken heart emojis.

By mid-May, some posts asked for the lockdown to be eased. The comments reflected the fear generated by the virus. The remarks also suggested that some people were not adhering to precautionary measures. Nevertheless, some group members expressed hope that life would return to normal.

Type of Messages

We identified 2220 messages and posts about COVID-19 from January 28 to June 27, 2020, in the WhatsApp group. Specifically, 51.6% were messages and discussions among group members and 27.5% were posts from other social media platforms and unknown sites (ie 4.2% from Instagram, 0.14% from Facebook, 4.1% from Twitter). Humor accounted for 5% and rumors accounted for 1% (refer to Figure 2) of the total number of messages. The social media posts shared

within the group were mostly from Twitter (81.5%), followed by Instagram (76.47%). Notably, Facebook posts only accounted for 2.5%.

Sentiments and Prayers

Among messages sent by the WhatsApp group members reflecting sentiments (fear, sadness, happiness, hope, anger, worry, cautiousness, and pride) and prayers, prayers had the highest proportion (23.07%). Fear was noticeable in 18.46% of posts, followed by sadness (15.38%), anger (8.2%), caution (7.7%), hope (4.6%), happiness, and stress (4.1%). The lowest sentiment was pride (2.05%), as seen in Figure 3.

These findings reveal that the proportions of fear and prayers were close, possibly indicating that fear led to prayers in the group. Most of the messages indicating fear occurred when the number of infected people and deaths increased. That emotion was followed by sadness because of the suffering the disease had caused. There was anger because some people were not following instructions on how to protect against the virus and respect quarantine rules and the lockdown.

Prevention Measures

Messages and posts regarding prevention measures against COVID-19 started in the group on February 26. The first post was concerned with how pilgrims from infected countries would be denied entry into Saudi Arabia for Umrah. On February 27, the first post appeared about protection against the virus. We found that 80 posts were about prevention measures applied by the government and roles and regulations on social distancing, hygiene, hand sanitizer utilization, and wearing masks. In 35 messages, the comments presented views on the prevention measures implemented by the government and how they would affect the members' lives (refer to Figure 4).

Comments and posts sent in the WhatsApp group during the 38 days, from February 26 to April 4, were regarding preventive measures and were taken from official websites and different social media channels. All the posts and comments stopped around the beginning of April. That could be because interest in protecting against a disease usually starts when major related events occur close to home. In the group's case, it was around the time that Umrah in Makkah was not allowed, which underlined the danger and importance of such measures.

Discussion

We studied the use of WhatsApp during the COVID-19 pandemic in Saudi Arabia and its effect on the attitudes and emotions of a WhatsApp group consisting of childhood friends. The extent to which WhatsApp was used was also evaluated. We found
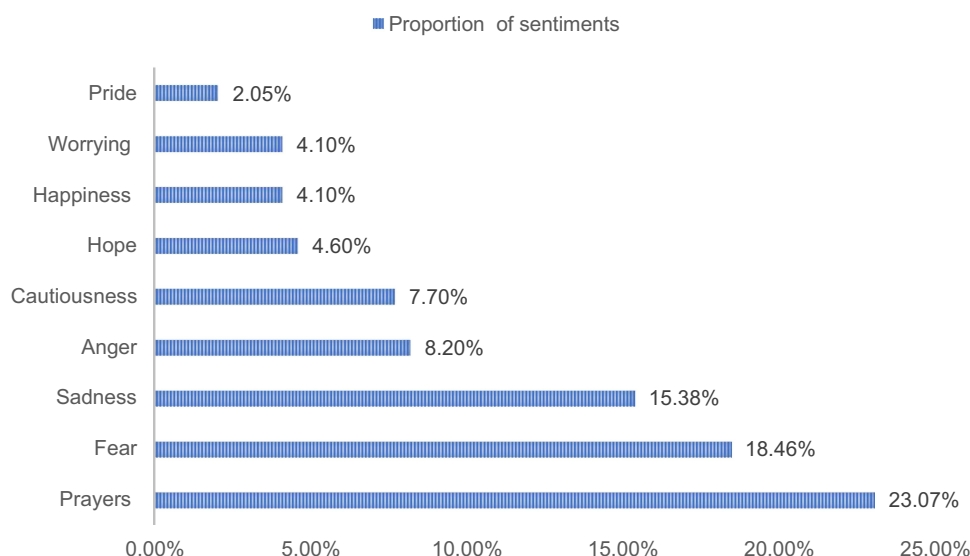

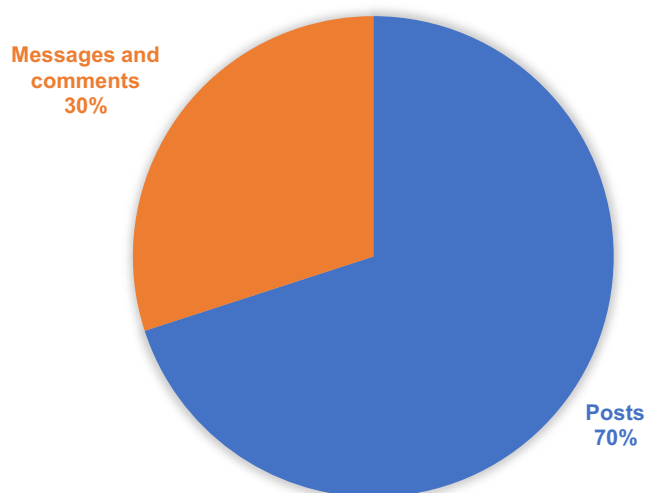**Figure 3** Proportion of sentiments and prayers.

Figure 4 Proportion of messages and posts about prevention measures for COVID-19.

that WhatsApp was employed more than all other social media apps. It could be because WhatsApp allows personal and intimate communication and enables rich social support among group members,[40] while ensuring high quality and improving communications capability. This platform helps its users to share their thoughts and feelings with individuals and within different groups.[41] Contrarily, other social media are usually used for information collection and self-expression.[40]

This study found that most participants employed WhatsApp as the main platform of communication with family and friends. They shared information about important topics, in tandem with images and posts from different social and Web platforms. This outcome is consistent with those of Alsanie[39] and Azeema and Nazuk,[28] who state that WhatsApp is not used only for chatting purposes but also for professional practices. We found that a high proportion of participants resent information about COVID-19 to their WhatsApp groups. In particular, 45% of the participants' messages were posts taken from different social media platforms. This result is in line with Kant,[23] who observed that WhatsApp users sent images and posts from various social media platforms.

Emotions and attitudes evident in the WhatsApp group chats signified a dismissal of the disease after the candidates first received information about it. This ignorance resulted in rumors regarding the effect the disease might have on the members' lives, especially regarding schools and examinations. However, other rumors and conspiracy theories about COVID-19 and the reality behind the pandemic, such as the relationship between the disease and the 5G cellular network or the possibility of it being a biological weapon, did not appear in the shared posts or in the discussions. This result is at odds with Ahmed et al,[15] who found that conspiracies were discussed on different social platforms, including WhatsApp. The discrepancy between the results could be due to differences between the participants' characteristics and interests.

We found that the attitude towards the disease at the beginning of the pandemic (first wave) was not fear or panic; instead, the prevalent attitude was denial because the event was presumably considered distant. This behavior is usually exhibited during pandemics and is known as optimism bias. The problem here is that it can lead people to underestimate a situation and ignore public health warnings.[29]

When COVID-19 reached Saudi Arabia, emotions were conveyed through comments and posts shared by the group members. Changes began occurring around the country with the closing of schools, workplaces, and mosques. Accordingly, sadness, hope, pride, and anger became evident in the comments. The closer the disease, the more prominent the emotions, and all posts and discussions were primarily around the effect of the pandemic. This result concurs with Jonung and Roeger,[42] who state that psychological effects begin to show when key changes occur and precautionary measures are adopted in a community. Posts and remarks concerning disease prevention began appearing along with the need to contain and ideally prevent the disease.[31]

Overall, the emotions and changing attitudes were clear with every post sent by the group members. Thus, posts and discussions among people affect their perceptions, attitudes, and emotions. When the posts addressed government

prevention measures for COVID-19 and people started following those guidelines, pride became evident. Conversely, when posts revealed that groups of people were disregarding social distancing and precautionary measures, anger became clear in the comments. Figure 5 indicates our interpretation of the pathway of communications effect on emotions and attitudes, where posts and events are presented in triangles, and emotions and attitudes are depicted through oval shapes. This finding is in agreement with Lin et al,[17] who state that social media users are impacted by what they read on social media. It also concurs with Raude and Setbon,[31] who found that the public's attitude and behavior changed over time with social media posts during the H1N1 pandemic. This finding could be because the information can be shared faster on social media than via any other conventional mechanism.[3]

Information about COVID-19 appeared widely on social media. Many people received such information through WhatsApp, as shown in our results. Over 50% of our participants indicated that they obtained the latest updates regarding COVID-19 from WhatsApp. Social media information can be false or fabricated.[5] Most of our participants (over 90%) stated that they confirmed the validity of the information received before resending it. We observed that the same behavior was detected in our WhatsApp group. In their group statements, members would add that they ensured the accuracy of the information they were sharing. If they failed to confirm a point, they would be clear that they had just resent the information without validating it.
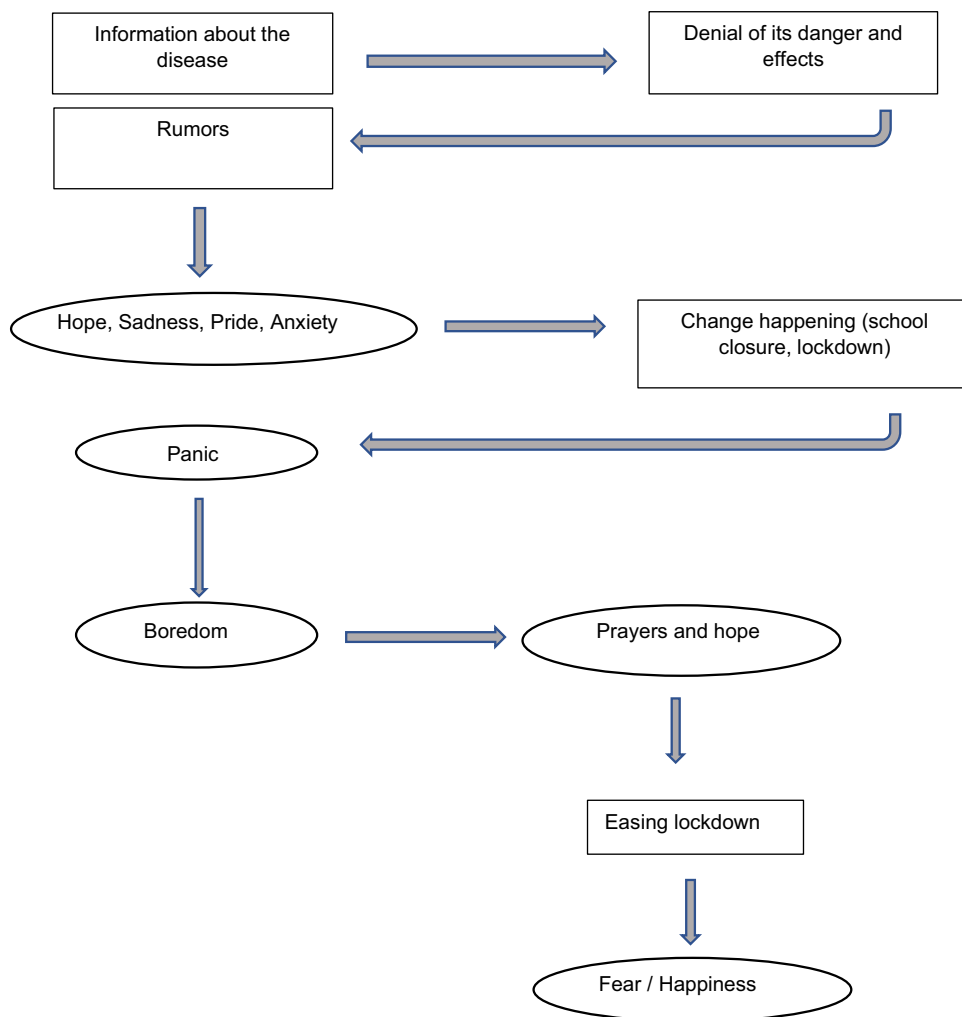

Figure 5 Our interpretation of pathway of communications effect on emotions and attitudes.

Conclusions

Overall, our results show that as a social communication and chatting platform, WhatsApp affects its users' attitudes, perceptions, and behavior just as much as any other social media, or perhaps even more. Posts and comments shared on WhatsApp reflected different emotions, ranging from fear, anger, and sadness to hope, happiness, and pride. They also included prayers and cautious behaviors were advocated. Notably, the main emotion observed was fear. Our finding agrees with those of Bavel et al,[29] who also determined that the central emotion during the pandemic was fear, which generated a certain defensive response. However, in our study, fear led to prayers, which reportedly increased during COVID-19 in many countries and faiths.[43] Emotions, perceptions, attitudes, and behaviors indicated by our participants were influenced by what they had been reading and hearing on WhatsApp and perhaps on other social media platforms.

Practical and Theoretical Implications

Our findings could make important practical contributions to parents, teachers, social media managers, and any individual using WhatsApp because the results showed that interacting on WhatsApp during the pandemic impacted emotions and attitudes. Therefore, WhatsApp and other social media could be utilized to help people during crises and hard times in the future. Each social media platform has a different use and a different way of interacting with its users, where the users might not know each other in person, such as on Twitter and YouTube, nor would they be able to amass hundreds of followers. On WhatsApp, the interaction between group members could be more personal; hence information dissemination and discussion could be different from other social media platforms, and more studies should look at WhatsApp as a tool affecting behavior in different situations.

This research had several limitations. Most of our survey respondents were living in cities. Therefore, the results reflect behaviors predominant in only cities, and the patterns could differ between villages, towns, and cities. Future research should address how chatting on social media platforms affects users' emotions, lives, and well-being. Such platforms (WhatsApp) are personal, and people there are open and their communications are more transparent than on other platforms. WhatsApp as social media platform appears to affect emotions and attitudes during the first wave of COVID-19. It could also affect people's behavior under different circumstances; therefore, social media is an important tool to study and explore.

Ethical Approval

The Institutional Review Board (IRB) of King Saud University (Subcommittee on Human and Social Research Ethics) approved this study (Ref No: KSU-HE-20-259). Participants gave their consent, and the principles specified in the Declaration of Helsinki were followed.

Disclosure

The author reports no conflicts of interest in this work.

References

1. Simon T, Goldberg A, Adini B. Socializing in emergencies - A review of the use of social media in emergency situations. *Int J Inf Manag*. 2015;35 (5):609–619. doi:10.1016/j.ijinfomgt.2015.07.001
2. Hellweg A. Social media sites of politicians influence their perception by constituents. *Elon J Undergrad Res Commun*. 2011;2(1):22–36.
3. Li C, Chen LJ, Chen X, Zhang M, Pang CP, Chen H. Retrospective analysis of the possibility of predicting the COVID-19 outbreak from Internet searches and social media data, China, 2020. *Euro Surveill*. 2020;25(10):1–5. doi:10.2807/1560-7917.ES.2020.25.10.2000199

4. Reuter C, Spielhofer T. Towards social resilience: a quantitative and qualitative survey on citizens' perception of social media in emergencies in Europe. *Technol Forecasting Soc Change*. 2017;121:168–180. doi:10.1016/j.techfore.2016.07.038

5. Rosenberg H, Syed S, Rezaie S. The Twitter pandemic: the critical role of Twitter in the dissemination of medical information and misinformation during the COVID-19 pandemic. *Can J Emerg Med*. 2020;6:1–4. doi:10.1017/cem.2020.361

6. Lu X, Vijaykumar S, Jin Y, Rogerson D. Think before you Share: beliefs and emotions that shaped COVID-19 (Mis) information vetting and sharing intentions among WhatsApp users in the United Kingdom. *Telemat Inform*. 2022;67:101750. doi:10.1016/j.tele.2021.101750

7. Henrich N, Holmes B, Brusic V. What the public was saying about the H1N1 vaccine: perceptions and issues discussed in on-line comments during the 2009 H1N1 pandemic. *PLoS One*. 2011;6(4):e18479. doi:10.1371/journal.pone.0018479

8. Young ME, Norman GR, Humphreys KR. Medicine in the popular press: the influence of the media on perceptions of disease. *PLoS One*. 2008;3(10):e3552. doi:10.1371/journal.pone.0003552

9. Liu S, Zhu M, Yu DJ, Rasin A, Young SD. Using real-time social media technologies to monitor levels of perceived stress and emotional state in college students: a web-based questionnaire study. *JMIR Ment Health*. 2017;4(1):e2. doi:10.2196/mental.5626

10. Reuter C, Kaufhold MA. Fifteen years of social media in emergencies: a retrospective review and future directions for crisis informatics. *J Contingencies Crisis Manag*. 2018;26(1):41–57. doi:10.1111/1468-5973.12196

11. WHO. WHO timeline – COVID-19; 2020. Available from: https://www.who.int/news-room/detail/27-04-2020-who-timeline—covid-19. Accessed August 23, 2022.

12. Cinelli M, Quattrociocchi W, Galeazzi A, et al. The COVID-19 social media infodemic. *Sci Rep*. 2020;10(1):16598. doi:10.1038/s41598-020-73510-5

13. Puyod JV, Charoensukmongkol P. Interacting effect of social media crisis communication and organizational citizenship behavior on employees' resistance to change during the COVID-19 crisis: evidence from university employees in the Philippines. *Asia Pac Soc Sci Rev*. 2021;21(3):13–27.

14. Venegas-Vera AV, Colbert GB, Lerma EV. Positive and negative impact of social media in the COVID-19 era. *Rev Cardiovasc Med*. 2020;21(4):561–564. doi:10.31083/j.rcm.2020.04.195

15. Ahmed W, Vidal-Alaball J, Downing J, López Seguí FL. Dangerous messages or satire? Analysing the conspiracy theory linking 5G to COVID-19 through social network analysis. *J Med Internet Res*. 2020;22(5):e19458. doi:10.2196/19458

16. Shahsavari S, Holur P, Tangherlini TR, Roychowdhury V. Conspiracy in the time of Corona: automatic detection of COVID-19 conspiracy theories in social media and the news. *arXiv Preprint ArXiv*. 2020. doi:10.1007/s42001-020-00086-5

17. Lin JS, Lee YI, Jin Y, Gilbreath B. Personality traits, motivations, and emotional consequences of social media usage. *Cyberpsychol Behav Soc Netw*. 2017;20(10):615–623. doi:10.1089/cyber.2017.0043

18. Waterloo SF, Baumgartner SE, Peter J, Valkenburg PM. Norms of online expressions of emotion: comparing Facebook, Twitter, Instagram, and WhatsApp. *New Media Soc*. 2018;20(5):1813–1831. doi:10.1177/1461444817707349

19. Freberg K, Palenchar MJ, Veil SR. Managing and sharing H1N1 crisis information using social media bookmarking services. *Public Relat Rev*. 2013;39(3):178–184. doi:10.1016/j.pubrev.2013.02.007

20. Vaughan E, Tinker T. Effective health risk communication about pandemic influenza for vulnerable populations. *Am J Public Health*. 2009;99(suppl 2):S324–S332. doi:10.2105/AJPH.2009.162537

21. Nouwens M, Griggio CF, Mackay WE. 'WhatsApp is for family: messenger is for friends' communication places in app ecosystems. In: Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems; 2017:727–735. doi: 10.1145/3025453.3025484.

22. Rautela S, Singhal T, Yerpude S. An insight into the changing world of communication- a generic study of undergraduate students' perception of WhatsApp and its usage. *Int J Appl Eng Res*. 2018;13(5):2213–2224.

23. Kant R. WhatsApp usage: attitude and perceptions of college students. Conflux. *J Educ*. 2018;5(9):27–35.

24. Boulos K, Giustini DM, Wheeler S. Instagram and WhatsApp in health and healthcare: an overview. *Future Internet*. 2016;8(3):37. doi:10.3390/fi8030037

25. Montag C, Błaszkiewicz K, Sariyska R, et al. Smartphone usage in the 21st century: who is active on WhatsApp? *BMC Res Notes*. 2015;8(1):331. doi:10.1186/s13104-015-1280-z

26. Martínez-Comeche JA, Ruthven I. Engaging interaction and long-term engagement with WhatsApp in an everyday life context: exploratory study. *J Doc*. 2021;77(4):825–850. doi:10.1108/JD-07-2020-0115

27. O'Hara KP, Massimi M, Harper R, Rubens S, Morris J. Everyday dwelling with WhatsApp. In: Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work and Social Computing; 2014:1131–1143. doi: 10.1145/2531602.2531679.

28. Azeema N, Nazuk A. WhatsApp and journalism: news practices of Pakistani journalists. *Sci Technol Dev*. 2017;36(4):249–258. doi:10.3923/std.2017.249.258

29. Bavel JJV, Baicker K, Boggio PS, et al. Using social and behavioural science to support COVID-19 pandemic response. *Nat Hum Behav*. 2020;4(5):460–471. doi:10.1038/s41562-020-0884-z

30. Sadique MZ, Edmunds WJ, Smith RD, et al. Precautionary behavior in response to perceived threat of pandemic influenza. *Emerg Infect Dis*. 2007;13(9):1307–1313. doi:10.3201/eid1309.070372

31. Raude J, Setbon M. Lay perceptions of the pandemic influenza threat. *Eur J Epidemiol*. 2009;24(7):339–342. doi:10.1007/s10654-009-9351-x

32. Chew C, Eysenbach G. Pandemics in the age of Twitter: content analysis of tweets during the 2009 H1N1 outbreak. *PLoS One*. 2010;5(11):e14118. doi:10.1371/journal.pone.0014118

33. Cauchemez S, Ferguson NM, Wachtel C, et al. Closure of schools during an influenza pandemic. *Lancet Infect Dis*. 2009;9(8):473–481. doi:10.1016/S1473-3099(09)70176-8

34. Herrera-Valdez MA, Cruz-Aponte M, Castillo-Chavez C. Multiple outbreaks for the same pandemic: local transportation and social distancing explain the different "waves" of A-H1N1pdm cases observed in México during 2009. *Math Biosci Eng*. 2011;8(1):21–48. doi:10.3934/mbe.2011.8.21

35. Sen-Crowe B, McKenney M, Elkbuli A. Social distancing during the COVID-19 pandemic: staying home saves lives. *Am J Emerg Med*. 2020;38(7):1519–1520. doi:10.1016/j.ajem.2020.03.063

36. UNESCO. COVID-19 educational disruption and response; 2020. Available from: https://en.unesco.org/covid19/educationresponse. Accessed August 23, 2022.

37. Jackson C, Vynnycky E, Mangtani P. The relationship between school holidays and transmission of influenza in England and wales. *Am J Epidemiol*. 2016;184(9):644–651. doi:10.1093/aje/kww083
38. WHO. COVID-19: IFRC, UNICEF and WHO issue guidance to protect children and support safe school operation; 2020. Available from: https://www.who.int/news-room/detail/10-03-2020-covid-19-ifrc-unicef-and-who-issue-guidance-to-protect-children-and-support-safe-school-operations. Accessed August 23, 2022.
39. Alsanie SI. Social media (Facebook, Twitter, WhatsApp) used, and its relationship with the university students' contact with their families in Saudi Arabia. *Univers J Psychol*. 2015;3(3):69–72. doi:10.13189/ujp.2015.030302
40. Karapanos E, Teixeira P, Gouveia R. Need fulfillment and experiences on social media: a case on Facebook and WhatsApp. *Comput Hum Behav*. 2016;55:888–897. doi:10.1016/j.chb.2015.10.015
41. Kaur A, Singh A. Remarkable contribution of WhatsApp in community. *Adv Math Sci J*. 2021;10(3):1413–1418. doi:10.37418/amsj.10.3.30
42. Jonung L, Roeger W. *The Macroeconomic Effects of a Pandemic in Europe. A Model-Based Assessment. (251 Ed.) (European Economy - Economic Papers)*. European Commission; 2006.
43. Coibion O, Gorodnichenko Y, Weber M. The cost of the COVID-19 crisis: lockdowns, macroeconomic expectations, and consumer spending. *COVID Econ*. 2020;20:1–51. doi:10.3386/w27141