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Dialogical Health Communication via Twitter (X) During COVID-19 in African Countries: Ghana as a Case Study

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Abstract: Social media platforms, such as Twitter (X), have a critical role in disseminating health information. The study aims to highlight the potential of Twitter (X) as an influential tool for health communication, in addition to providing findings related to public health communication strategies in Ghana. The study investigated the role of Twitter (X) as a platform for building interactive health communication between the health communication system and citizens in Ghana during the COVID-19 pandemic of 2020–2022. Additionally, it has the potential to contribute to building dialogical health communication. The study analyzed a sample of COVID-19-related tweets from the official Ghana Health Service Twitter (X) account @_GHS from 2020 to 2022. The results showed that Twitter (X) was a key tool for health communication during the COVID-19 pandemic in Ghana, with both health institutions and the public sharing large amounts of health information. Furthermore, the study found evidence of dialogic communication, in which healthcare institutions and professionals are actively engaging with the public on Twitter (X). It concluded that public health communication on Twitter (X) has changed over time, as well as that the interactive health communication between the health communication system and citizens in Ghana was affected positively during the COVID-19 outbreak. It highlighted Twitter (X)'s potential as a tool for establishing a dialogue loop and building dialogic health communication. The results showed that before COVID-19, Ghana did not use Twitter (X) effectively to communicate with citizens about health matters. Twitter (X), with its wide reach and highly interactive nature through features such as retweets, has become a major platform for interactions facilitating dialogue between health institutions and health professionals and facilitating dialogue in public spaces surrounding health issues like COVID-19.

Keywords: public health communication; COVID-19; Twitter (X); Ghana health service; crisis communication; dialogic communication; dialogic loop

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1. Introduction

Media can set the agenda of the press and accordingly the public opinion on certain issues, particularly those on war and crisis. Furthermore, social media plays a role in the order of the audiences' priorities [1]. McCombs and Shaw, who developed the agenda-setting theory in 1968, highlighted that there is a connection between the issues reflected in media and the increasing public interest in those issues. In the new media era, new media features, such as hyperlinks and multimedia, can contribute more to stressing issues than others. New media can affect the significance given to topics on the public agenda by concentrating on some and disregarding others. Social media platforms play a role in ordering the priorities of audiences.

People find nontraditional media to be far more effective and prefer them to traditional media when it comes to tracking human and citizens' rights topics [2–4]. Professionals are concerned that traditional media is losing its efficiency as a tool for circulating health-related messages, and they see social media as an influential tool to do so [5]. Traditional

media has a certain strategy and more needs to be done in this regard, but social media platforms such as Twitter (X) and Facebook were used to share information, spread advice and instructions, expose misinformation, and promote public health measures such as wearing masks and social distancing. The media have a great duty to highlight society's most important problems and issues, such as political [6] and refugees and migration issues [7–11], transmit details framing events, provide a forum for public debate, and stimulate collective memory [12], as well as prioritize humanitarian principles, and shape public discourse and affect policy decisions [13].

The identification of the seventh human coronavirus, the severe serious respiratory syndrome coronavirus (SARS-CoV-2) [14], came after the January 2020 pneumonia pandemic [15]. According to [16], the COVID-19 pandemic was originally revealed in Wuhan, China, on 1 December 2019 and reported to the WHO regional office in China on 31 December 2019. On 30 January 2020, the World Health Organization declared it a public health emergency of international concern [17]. According to the WHO's March 2023 global situation report on the virus, there have been 759 million confirmed cases, with nearly 7 million fatalities. The Americas have been the most affected region, with over 2 million deaths, while Africa has been the least affected. Lockdowns, travel bans, gathering restrictions, and social isolation have significantly impacted billions of people worldwide for almost two years. The economic crisis, exacerbated by the impact of the COVID-19 pandemic, has strained many resources, including the press. The pandemic has led to the implementation of measures affecting the media environment. The Department of Economic and Social Affairs and Economic Analysis of the United Nations estimates that 71–100 million people may have fallen into extreme poverty as a result [18,19]. Three months after the World Health Organization (WHO) declared a "public health emergency of international concern" in relation to the emergence of the new coronavirus (SARS-CoV-2) that causes COVID-19, the WHO Director-General declared COVID-19 a pandemic at a media briefing on 11 March 2020 [20].

Traditional media such as newspapers, radio, and television served as the primary channels for distributing information from government and health institutions. These channels were effective in reaching wide audiences, including those without access to the internet, ensuring that essential public health messages, such as information on vaccination, mask-wearing, and social distancing, were widely communicated. Nontraditional media, especially social media platforms, facilitated quick information exchange and allowed for more interactive communication. Social media had a vital role in engaging citizens, providing real-time updates, and enabling the sharing of personal experiences. However, the decentralized and open nature of social media also led to the proliferation of misinformation, which posed significant challenges.

The division of labor between these media types was not merely incidental but was promoted as a strategic approach to managing the flow of information during the pandemic. Governments and health authorities utilize traditional media for delivering official, authoritative messages while identifying the complementary role of social media in fostering engagement and rapid dissemination. During the COVID-19 pandemic, a different "division of labor" emerged between traditional and nontraditional media, with each type playing a balancing role in disseminating serious information.

Social media has been used to spread critical information during public health emergencies, such as the SARS and COVID-19 pandemics. Data showed a bigger reliance on the media during the 2003 SARS epidemic in China, as the Chinese relied more on the Internet [21]. Ref. [22] found that in reaction to the declarations and other reports of the appearance of a severe respiratory virus, public health professionals swiftly developed and distributed public health messaging about the pandemic throughout the world. This could explain why social media platforms were used for numerous public health communications throughout the pandemic. According to [23], those platforms were also used effectively, for example, in online learning. Despite the gap between different countries, as students were dependent on the media to continue their education during the pandemic, they

were able to develop strategies to manage this dependency and not affect their academic performance negatively. According to [24], in a study on public health communication and social media engagement during the COVID-19 pandemic, COVID-related content achieved proportionately more engagement on Facebook.

Twitter (X) is well-suited for local decision-makers, such as mayors and local health officials. On Twitter (X), video is the most effective tool, but text messages containing concise health guidelines are more popular on Facebook. Additionally, Twitter (X) penalizes you for sending too many messages, whereas Facebook does not show the same dynamics. According to [25], public health officials and policymakers have to consider which messages best meet the needs of Twitter (X) audiences to make the best use of communication exchanges. Public health accounts that do not currently use risk communication policies in their tweets may be missing a significant chance to engage with users about justifying health risks related to COVID-19.

1.1. Public Health Crisis Management and Communication

Communication is crucial to our identity as humans. It symbolizes the strength of symbolic representation as well as the way of delivering information [26]. Communication is the use of all available strategies to encourage people to be engaged in decisions that are important for their health. Those strategies consist of verbal, visual, and written basics that support people to make healthier choices. Furthermore, those strategies include media exposure, health literacy, the development of helpful materials among media platforms, and the use of communication channels to convey health messages to enhance people's knowledge, attitudes, and behaviors through mass media or interpersonal communication. Any health crisis must be considered, and communication is critical in this process because it regulates how the public observes risk [27]. As well as using other media, including radio, television, newspapers, flyers, brochures, websites, and social media platforms (i.e., Twitter (X), Facebook, Instagram, and YouTube), to convey health messages. Feasible communication within a well-being emergency can ease exposed concerns and empower the appropriation of critical risk-averse behaviors.

Ref. [28] defines crisis management as the process of avoiding or limiting the damage that a crisis might cause. Crisis management is a multifaceted process. There are three phases of crisis management: (1) pre-crisis by preparation and prevention; (2) crisis response by management; and (3) post-crisis, which follows procedures to reinforce readiness for the next crisis and follows through on initiatives made during the crisis phase, such as following up on information.

Ref. [29] defines public health communication as the practice of influencing people, groups, and organizations with the purpose of facilitating situations that are favorable to both human and environmental health. Public health communication aids in educating the public so they may choose effective preventive and therapeutic actions [30]. During a pandemic or other health emergency, public health organizations and officials play a particularly important role as facilitators of timely and accurate information, helping the public to accurately perceive health risks and adjust their behavior as needed to mitigate risks [31]. According to the Pan American Health Organization, an important goal of health communication during epidemics is to persuade the public with facts to uphold the authority of official sources as appropriate communication channels. According to [32], health communication studies encompass a wide range of topics that include disease prevention, health promotion, health policy, creating guidelines for healthcare providers, and enhancing the overall quality of life for people in society.

These health communication studies aimed at improving public health by providing effective communication strategies and interferences that explain various health problems and worries. As well as by understanding how to connect effectively with different levels of audiences and health communicators. To show also how they can change behavior, encourage healthy lifestyles, and raise awareness towards health topics. Healthcare organizations can differentiate themselves as trusted sources of information by providing timely,

accurate health information to key members of the public through social media sites. Social media can also be used to engage, interact, and connect with key members of the public on health-related issues and other people who have similar health interests and concerns [33].

Health crisis management refers to the implementation by specific groups of people of a coordinated and efficient plan of action in the event of threats to civilian health and health systems, regardless of cause or severity [34]. Using technology to improve preparedness and recovery capacities in the face of crises is one of the key planning strategies to lower risks and the susceptibility of communities [35]. There is evidence that the media is crucial to crisis management [36]. During crises and public health situations like the COVID-19 epidemic, the public has been more active on social media. Therefore, crisis communication specialists must be aware of how to usefully maximize these instruments [37].

1.1.1. Effects of Social Media on Public Health Communication

Social media is one of the most commonly used information sources due to its promise of rapid, low-cost, and simple access. Importantly, there is overwhelming proof that social media can have a crucial role in the process of formation [38], given the fact that more people are turning to these platforms as their main sources of news and information in general. According to [39], terror and anxiety indeed lead to an increase in the need for accurate, dependable, and enlightening information whenever a crisis of significance for public health happens [40]. By providing channels for both individual and mass communication, social media satisfy these desires.

Mass media have traditionally played a key role in the flow of information between government agencies and the public during crises, but increased use of social media applications such as Twitter (X) has made citizens able to interact more directly with government agencies and individuals. Social media platforms such as Twitter (X) have made it possible for individuals to look for and exchange news and information during crises to lessen uncertainty and cope with risks [41]. The ability of social media to enable engagement—the interactive, synchronous conversation and collaboration between many participants—is one of their crucial unique features, because within the availability of multidirectional communication via social media, public health organizations can move from the basic communication typical of traditional mass media to a fully participatory discussion of information distribution [42]. According to [43], social media helps public health organizations and their audiences communicate with one another in ways that advance the "common good". Further, 67% of internet users utilize social networking sites [44]. The chance to reach audiences that would want to receive health information through these channels is presented by social media, as the number of users increases continually [42]. As per [25] using social media applications has been one of the ways that the public has kept up with important details and updates on COVID-19. During the shutdown, social networking platforms were crucial for spreading information [45]. Following the pandemic-induced closure of borders, social distancing measures, and strain on healthcare systems, individuals began seeking alternative means to obtain reliable information on safeguarding themselves against the disaster.

A significant number of users have named Twitter (X) as their primary news source [46]. As with the Ebola outbreak, Twitter (X) was crucial for shaping public opinion and sharing information [47]. Several other publications that discuss the subject of discourse have explained the function of Twitter (X) during the pandemic [48]. By publishing health tips and sharing new medical discoveries, healthcare organizations can increase public engagement and improve their reach on social media, including Twitter (X). This strategy helps in both disseminating information and encouraging dialogue with the public. As a result, healthcare subscribers and followers on social media platforms act as information ambassadors and help spread information about the organization's services and programs to a wider audience [33]. Ref. [49] showed that providing useful information via Twitter (X) can effectively achieve these goals. Ref. [24] said that "social media offers distinct opportunities for governments seeking to communicate important health information during

times of crisis". Thus, social media has become an important tool in crisis communications; it helps to rapidly circulate information, involve the community, monitor social media activity, manage emergency response efforts, and plan for upcoming crises.

1.1.2. Twitter (X)'s Role in Public Health Communication During COVID-19

Social media are used for health communication among patients, people, and professionals [39]. The use of visuals such as videos and images has an important effect on the circulation of information, especially on social media, where users often discuss health-related issues. Ref. [50] explored the potential of multimedia tweets in communicating emerging health information. According to [51], Twitter (X) has served as a crucial data source for academics and business experts conducting social media research since it was launched. When the COVID-19 outbreak began, Twitter (X) developed into a vital resource for all populations to gather and exchange information, form opinions, and express insights about COVID-19 [52].

Twitter (X), which is one of the most popular venues for communication around the globe, can aid in the quick spread of information during a pandemic, particularly during a public health emergency [53]. From official health organizations and governments to healthcare workers and ordinary citizens, Twitter (X) has provided a platform for individuals to share valuable information about COVID-19. Twitter (X) can offer assistance in communicating well-being and chance messages. Graphics can promote an open understanding of different information related to health risks [54]. As one of the most widely utilized and well-established social media platforms, Twitter (X) has incredible potential for critical and cost-effective visual wellbeing risk communication. It also permits open well-being specialists and government organizations to reach millions of individuals and communities. Twitter (X) also empowers the investigation, observation, and assessment of well-being communication campaigns [55].

Twitter (X) meaningfully affected the relief and rescue activities in many countries, allowing people trapped underneath the debris to contact, pursue, and receive [56]. Additionally, health organizations can increase public engagement by sharing health tips and new medical discoveries that are relevant and useful for health-conscious individuals on Twitter (X). This can not only disseminate important information but also foster dialogue and interaction with the public [49]. In addition, subscribers and followers of health organizations on social media can become information ambassadors, helping to spread information and promote the organization's services and programs. Twitter (X) played a key role in communicating health risks during the COVID-19 health crisis. Twitter (X) has been crucial in communicating health risks [57,58]. The WHO constantly revised its mask-wearing guidelines throughout 2020 and even used hashtags such as ***#WearAMask*** *and* ***#StayHealthyAtHomes***.

Twitter (X) was recognized as the foremost regularly utilized professional social media platform by [59]. Data circulated on Twitter (X), reach a wide gathering of people and reflect on distinguishing health-related topics around the world [60]. Ref. [61] found that Twitter (X) can be used as a platform for rapid communication on public health topics with the public when they analyzed the use of Twitter (X) by G7 world leaders during the COVID-19 pandemic. Ref. [25] explored the engagement of Canadian decision-makers and public health officials in their tweets during COVID-19. They suggested that "health officials and other professionals not currently on Twitter (X) should consider the platform as a means of disseminating information that Twitter (X) users clearly want to share".

2. Theoretical Background

The dialogic theory was expanded to describe how organizations build interactive relationships with the public through a variety of digital platforms, including websites, blogs, and social media sites like Facebook and Twitter (X), according to studies by [62–68] that suggest innovative and practical dialogue techniques to support dialogic communication on the Internet. These techniques include the following: (a) making the interface simple to

use; (b) holding visitors' interest; (c) enticing them to return; (d) offering insightful content; and I establishing a dialogic loop.

A dialogic loIp is a two-way communication process that gives the public the chance to approach organizations with questions, concerns, and problems and gives the organizations a chance to reply. For businesses to effectively communicate with their public, dialogic theory states that they must establish sincere and moral relationships with them. They can accomplish this by creating channels of dialogic communication that are advantageous to both sides [69]. On social media sites like Twitter (X), where users can share information and have real-time conversations, the dialogic aspect of the Web is most evident. Because of this, a number of contexts have studied in depth how to promote dialogic discourse on social media [62,63]. This underscores the undeniable significance of Twitter (X) as a medium for public health communication, as dialogic loops elucidate the process of sharing and circulating information or messages among diverse individuals or groups. Dialogic loops are becoming more and more significant in the digital age because of how quickly and across various platforms information can spread. They can serve a wide range of purposes, from disseminating news and information about public health issues like COVID-19 to advancing social causes. Twitter (X) can get real-time updates on COVID-19 cases, hospitalizations, and deaths.

The dialogue highlights how crucial exchange and communication are to developing a common understanding or body of knowledge. Dialogic loops can be advantageous because they facilitate the sharing of various viewpoints and experiences, which results in a more thorough and nuanced comprehension of a subject or problem. They also provide forums for discussion and feedback, which can enhance the accuracy of the information and promote critical thinking. For instance, ref. [67] examined the interactivity of corporate websites and discovered that just a tiny percentage of Fortune 500 companies used the conversational communication techniques that Ref. [68] had suggested. Ref. [63] investigated how environmental groups use dialogue strategies on Facebook profiles and discovered that these strategies increase interactive engagement between the organization and its visitors.

3. Methodological Framework

3.1. The Study Problem and Main Questions

In Asia, Europe, and the USA, social media has grown exponentially. It has, however, taken a slow start in developing nations, notably Ghana, before it began to gain traction. With the advent of infrastructure, technologies, and service improvements, it has become a new arena for many institutions due to the proliferation of cell phones, tablets, and wireless internet and data services (3G and 4G) across the country. The amount of bandwidth provided by the government's fiber optic project has made it possible [70]. Twitter's rise in popularity is significant, considering that over five million people use the microblogging platform in Ghana. Twitter is mostly popular among the youth; according to statistics provided by Global WebIndex, about 71% of Ghana's Twitter users are within the age range of 16 to 34 [71]. This makes it possible to reach a huge market segment of young adults who are less likely to watch television stations or read newspapers; hence, tweets are more likely to influence their voting intention. Before the social media era began, African governments spent a significant amount of money establishing and maintaining state-owned media such as television, radio, newspapers, and community advertising. These media sources served as primary sources for educating the public-on-public safety issues and highlighting serious health threats [72]. However, the advent of the internet and the proliferation of internet-enabled technology media such as computers, laptops, and mobile devices have opened up new opportunities for public communication [73]. Social media has grown in importance as a news and information source in Ghana since the introduction of smartphones. Social media has transformed the way Ghanaians receive information, improved content distribution, and expanded audience reach. Social media can be used in crisis communications by providing updates, engaging with the public,

monitoring what people are saying, organizing volunteers or directing people to safe areas, building relationships with key stakeholders, identifying potential risks and vulnerabilities, and developing communication strategies in advance. Ghanaians frequently utilize social networking sites, including Twitter (X), Facebook, YouTube, blogs, Google Plus, LinkedIn, Telegram, WhatsApp, other mobile applications, and other online platforms [74].

Various levels of government are adopting social media platforms as communication tools as part of an overall public health communication strategy or framework to engage citizens [75]. According to [28], Twitter (X) and Facebook were the most popular social media used in crisis communications. With 940 thousand registered users, Ghana is the fourth African country with the most Twitter (X) users, which might have encouraged the government of Ghana to present its public health communication campaigns on the platform.

Many African governments have widely embraced social media as an efficient tool for communication, using it as a veritable media channel to disseminate information about public health. Other issues requiring public mobilization include HIV/AIDS and lead poisoning [72]. The pandemic has affected Ghana, the fifth African country with the highest number of reported coronavirus cases after South Africa, Egypt, Nigeria, and Morocco, resulting in nearly 1500 deaths. The country reported its first case of COVID-19 on 12 March 2020, after two tourists from Turkey and Norway brought the virus into the country [17]. The COVID-19 pandemic has highlighted the critical need for effective health communication between people and the health communication system in Ghana. In response to the COVID-19 pandemic, the Ghanaian government has said it will "improve surveillance systems and build response capabilities to detect, delay, and respond to COVID-19 outbreaks in Ghana". Using local and online media, the Emergency Preparedness and Response Plan (EPRP) in Ghana focuses on mobilizing national resources and implementing strategies for better risk and behavioral change communication [74]. The government of Ghana applied several strategies and initiatives aimed at improving the health system, such as the National Health Insurance Scheme (NHIS) [76], which aims at offering health insurance treatment to a vital portion of the citizens, and the Community-Based Health Planning and Services program (CHPS), which aims at expanding access to healthcare services at the public level.

Despite that improvement, the health system in Ghana faces some challenges, including insufficient infrastructure and apparatus, insufficient numbers of healthcare workers, limited funding, and poor supply of healthcare services and access to crucial health services in many countryside areas. Ref. [5] set out to understand the effectiveness, evolution, and dynamics of health communication media currently used in Ghana. The Ministry of Health is accountable for the general administration of the health sector, while the Ghana Health Service (GIS) is responsible for the distribution of health services at the district and community levels.

Ref. [77] identified that the government of Ghana used frequent Minister's Press Briefings, Presidential addresses, and Social and Traditional Media to provide information to the citizens. These communication strategies have been used by the government to "Spread Calm, Not Fear" and to drive the entire population with the government in the fight against COVID-19.

Many studies analyzed how government communications on Twitter (X) had been during the pandemic. However, the study did not address the transformation of public health communication over time. When Ref. [73] examined how national governments in anglophone African countries' health ministries and agencies used social media during the first three months of the COVID-19 pandemic, they found that social media platforms were used by the various health ministries and organizations in charge of the COVID-19 response, which revealed that the health ministries had a sizable social media presence. In terms of public participation and visibility of health ministries and agencies, Facebook was the most widely used social media site, but Twitter (X) was effective in posting more informative content.

On 15 March 2020, the Ministry of Health, Ghana, in collaboration with the Ghana Health Service (GHS) [78], confirmed the record of its first two COVID-19 cases. To exercise effective public health communication, the government of Ghana, through the Ghana Health Service, used social media to deliver messages on COVID-19, like other countries and international organizations. However, despite the ongoing recording of new cases of the virus, trends in public health communication on social media have evolved. During the pandemic, Ghana's Center for Disease Control, the Ministry of Information, and the Ministry of Health were effective in public health communication on Twitter (X). However, the Ghana Health Service proved more efficient with its frequent updates on the virus. This explains why we monitored the Ghana Health Service Twitter (X) account for this study and data gathering.

Since the use of Twitter (X) in health communication in Ghana was not common before 2020, many health professionals and organizations in the country were more familiar with traditional forms of health communication, such as radio and television, and less likely to use social media platforms like Twitter (X). One of the challenges that limited the use of Twitter (X) for health communication in Ghana before 2020 was the quite low level of internet penetration in the country and the limited awareness among health professionals and organizations about the potential of Twitter (X) as a tool for health communication.

The study aims to explore the role of Twitter (X) as a tool for building dialogic health communication between people and the health communication system in Ghana during COVID-19 from 2020 to 2022. It tries to fill this gap and investigate how COVID-19-related posts have changed in Ghana since 2020.

The main research questions are:

(RQ1) How COVID-19-related issues were tweeted compared to other issues from 2020?

(RQ2) How Twitter (X) was a potential tool for building dialogic health communication between people and the health communication system in Ghana during COVID-19 from 2020 to 2022?

3.2. Methods and Procedures

To answer this question, the study conducted a tweet analysis of the official Twitter (X) page of the Ghana Health Service's (GHS) Twitter (X) account (@_GHSofficial) to understand how COVID-19-related posts have changed since 2020.

(@_GHSofficial) (Figure 1) is an officially verified account of the Ghana Health Service; it refers to the official Twitter (X) account of the Ghana Health Service (GHS). The Ghana Health Service is the main public sector agency responsible for the planning, implementation, and management of healthcare delivery in Ghana. The GHS account on Twitter (X) may be used to disseminate information about health issues, provide updates on public health campaigns, and engage with members of the public on matters related to healthcare in Ghana. (@_GHS official) exercised public health communication on Twitter (X) during the pandemic by delivering updates on COVID-19 statistics and educating the public on the need to wear masks, wash hands often, use sanitizers, and be vaccinated.

The service of the Twitter Search and Analytics tool socialbearing.com analytical application, which is a social media analytics and monitoring tool, was employed in order to give more details in the analysis of the gathered data. It provides real-time data and visualizations, such as graphs and charts, to help gain insights into social media trends. Ref. [79] stated that the social media analytics tool "Social Bearing" is used for studies using conversations or keywords on Twitter (X). The social media analytics tool "Social Bearing" can sort tweets according to metrics including reach, sentiment, engagement, and followers. Tweets can be filtered by top words and content type, whether it is mentions, links, or images [80]. The advanced Twitter (X) search function was used to filter the posts that contained the following keywords: "***Coronavirus***" and "***COVID-19***" during the period 2020–2022. After using the keywords ***coronavirus*** or ***COVID-19*** to filter through the posts of GHS on Twitter (X) from July 2020 to 31 December 2022, a total of 338 posts relating to COVID-19 were gathered. The Ghana Health Service account was created in June 2020, but

public health communication started in July 2020. That is why July 2020 was considered the starting point for gathering the data. Data analysis is the process of decomposing a phenomenon into its essential elements for better understanding [81].

Figure 1. GHS official Twitter (X) account.

During the COVID-19 pandemic, most governmental and non-governmental institutions used Twitter (X) to conduct public health communications. This study analyzed tweets related to COVID-19 in Ghana from July 2020 to December 2022 on the Ghana Health Service Twitter (X) account from 2020 to 2022. Tweets for themes related to health communication, such as information dissemination, community engagement, and feedback mechanisms, were analyzed.

The purpose of conducting the tweet analysis was to analyze patterns, themes, and trends in the data through a process of coding and classification. Qualitative research is exploratory and is used to explore topics" (Creswell, 2007). The reason for this method was to explore, collect, compare, and analyze public health communication posts on the official Ghana Health Service account on Twitter (X)(@_GHSofficial) from 2020 to 2022 and to understand whether public health about COVID-19 after 2020. The GHS account on Twitter (X) contained 1745 tweets through 31 December 2022 to understand if there were changes in communication.

This study used text and statistical tools (numbers, tables, and charts) to present and analyze the collected data. We present the data gathered by analyzing the themes on the GHS Twitter (X) account with the aid of charts and images, where necessary. The analysis and interpretation took into account the main research questions. For that reason, the service of the SocialBearing analytical application, which is a social media analytics and monitoring tool, was also employed in order to give more details in the analysis of the gathered data. It provides real-time data and visualizations, such as charts and graphs, to help users gain insights into social media trends and enhance their social media policies. The application's search engine attributes the GHS handle on Twitter (X), @_GHSofficial, to the collection of detailed data on the GHS. It then generates every piece of information regarding GHS on Twitter (X).

4. Findings and Data Presentation

Figure 2 shows that COVID-19-related posts by the Ghana Health Service on Twitter (X) were uneven. The chart shows that the most GHS has tweeted about COVID-19 in a particular month is 31 times. At the same time, in some months, there was not even a single post on the virus. The chart also indicates that, while there was a massive increase in public health communication against the virus in Q3 of 2021 with 73 COVID-19-related posts,

public health communication in Q3 of 2022 declined with 13 COVID-19-related tweets. In fact, October and November 2022 both have no records of COVID-19-related tweets. The 2020 posts cover just half a year (from July to the end of December 2020).

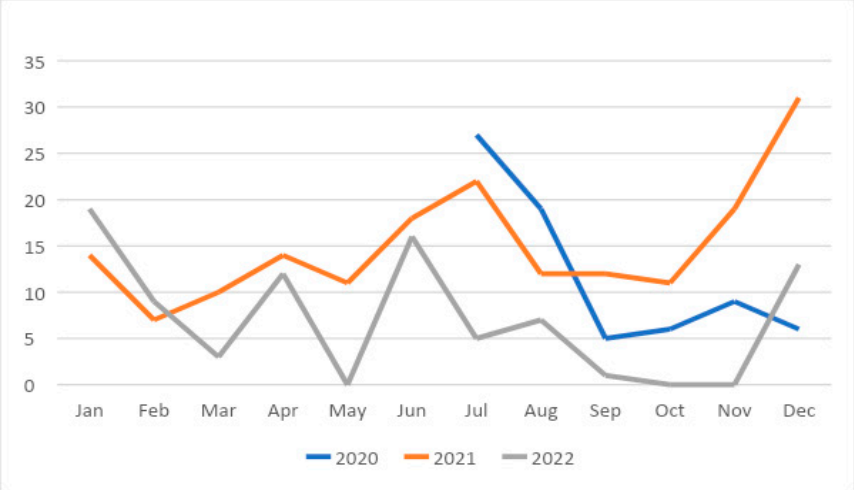

Figure 2. The pattern of COVID-19-related posts over time.

The total number of COVID-19-related posts made each year, with 2021 being the period with the most COVID-19-related content, Despite the Twitter (X) account's creation in June 2020, the year 2020 recorded the least number of posts as they covered only just half a year (from July to the end of December 2020). Consequently, the chart indicates a drastic decrease in public health communication from 2021 to 2022, as Figure 3 below indicates.

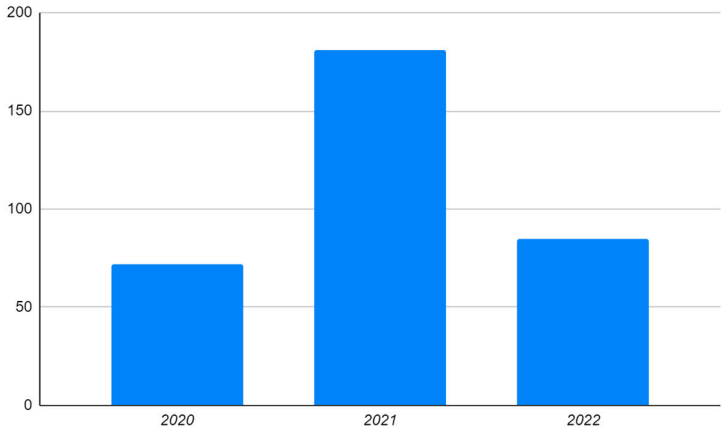

Figure 3. The number of COVID-19-related posts in the respective years (2020–2022).

As shown in Figure 4, The Social Bearing application was effective in answering how often COVID-19-related issues were tweeted compared to other issues from 2020. This is an analytical detail of GHS showing the period, the word cloud, the hashtag cloud, the post, the tweets by sentiment, the reach, the impression, and all other necessary details regarding GHS on Twitter (X). The result shows that, as of the 829th day, which is an inclusion of the years 2022, 2021, and some months in 2020, the hashtag cloud and word cloud were dominated by hashtags and words relating to COVID-19.

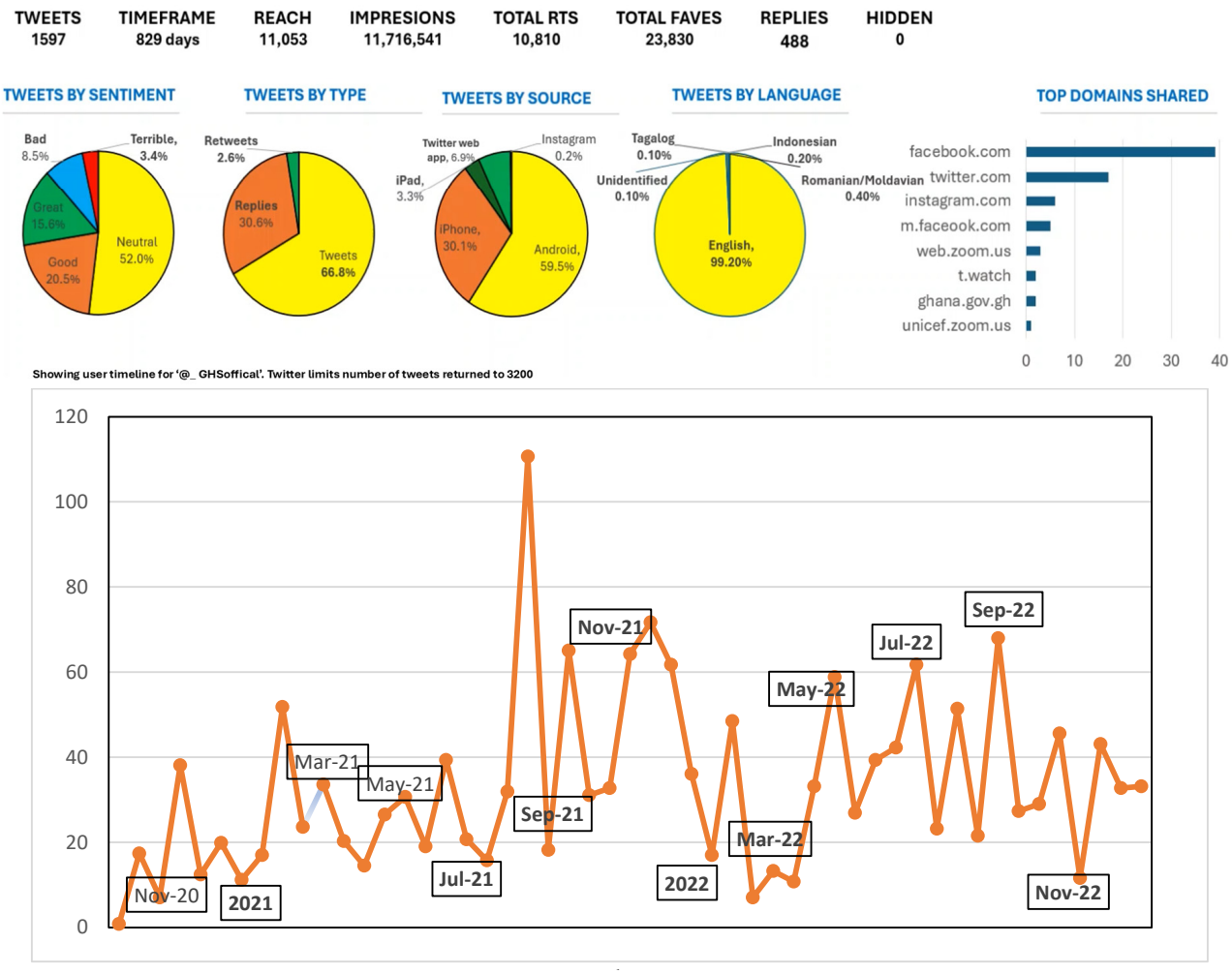

Figure 4. User Search and Analytics for "@_GHSoffical": Timeframe of 829 days.

Figure 5 shows that **#covid19isreal, #stayalertandstaysafe, #maskisamust, #covid19**, and **#thevaccinsaresafe** were examples of the most used hashtags in this period.

Figure 5. The most used hashtags and words. Timeframe of the above mentioned 829 days.

Figure 6 below shows a different narrative. The result shows that on the 397th day, which is an inclusion of the months in 2022 and the last two months of 2021, the hashtag cloud and the word cloud were both dominated by conversation relating to other health problems like malaria, hepatitis, polio, and diabetes.

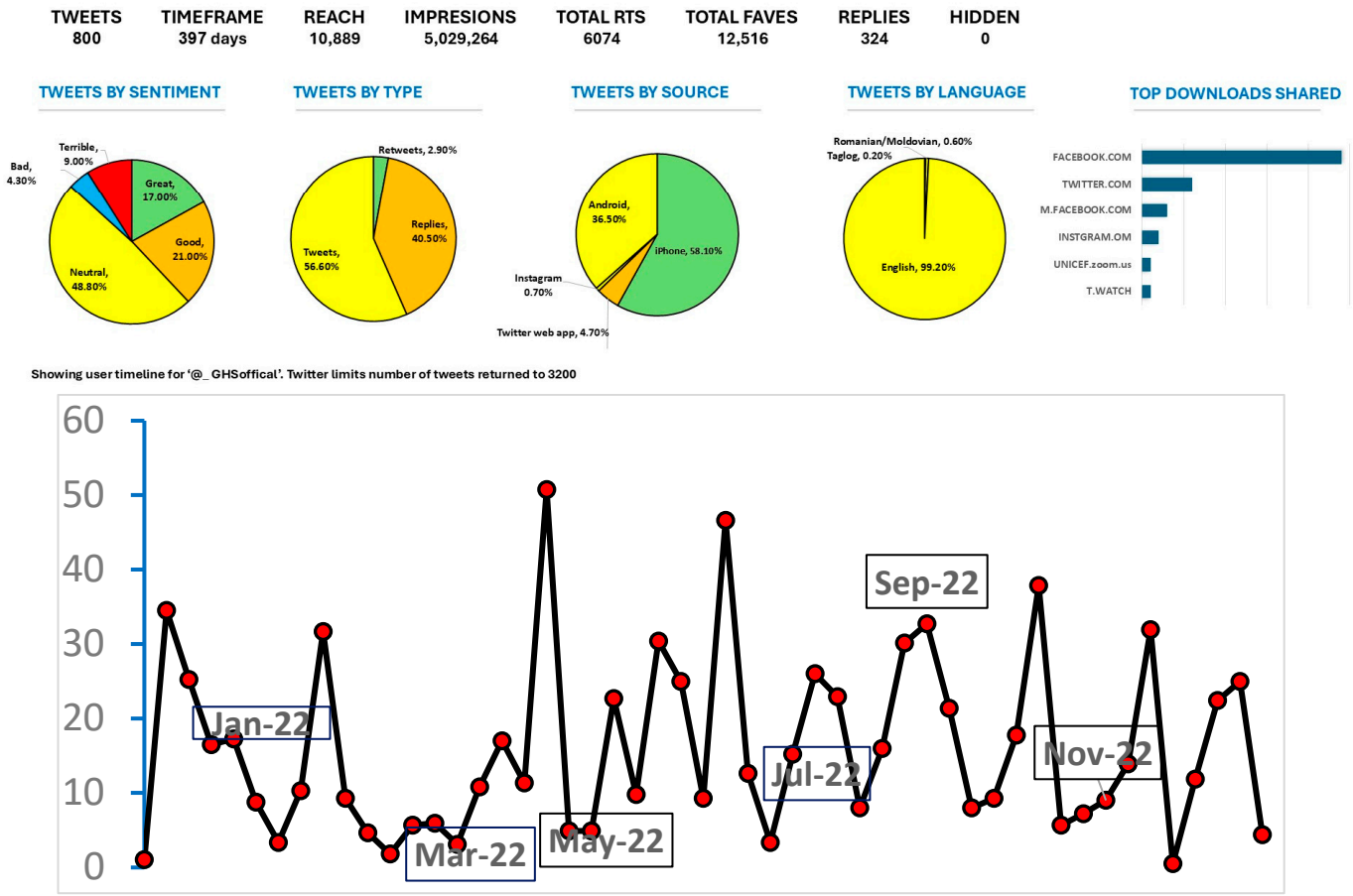

Figure 6. User Search and Analytics for "@_GHSoffical": Timeframe of 397 days.

Figure 7 shows examples of the most used hashtags by GHS during that period, which are: ***#zeromalariasstartsithme, #kickpolioouotofghana, #helpkickoliooutofghana, #vaccinateyourchildnowagainstpolio,*** and ***#rollbackmalaria.***

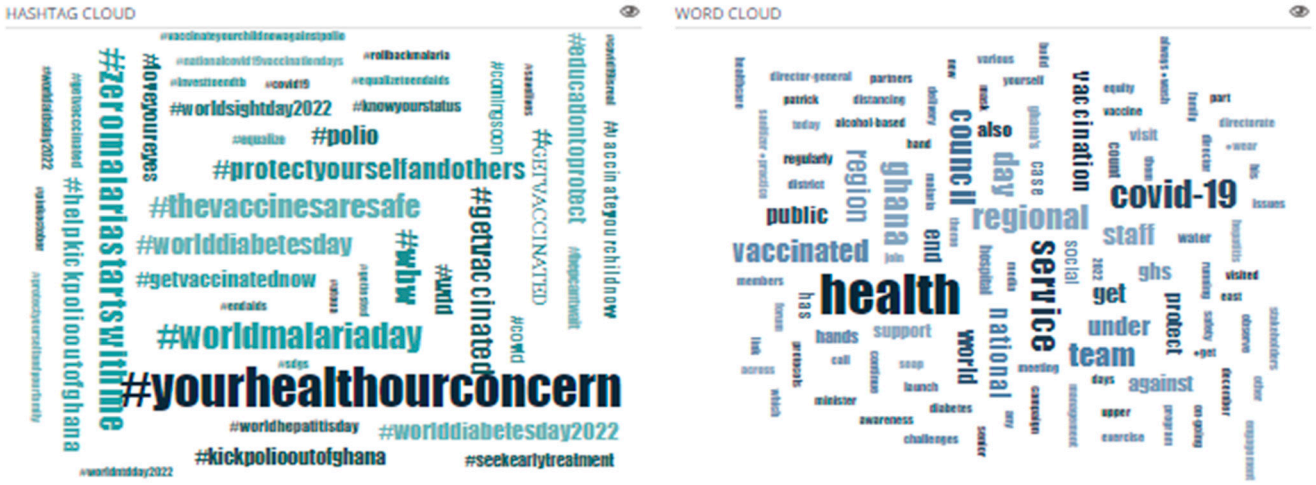

Figure 7. The most used hashtags and words. Timeframe of the above mentioned 397 days.

Figure 8 below shows data as of the 115th day, which includes the last quarter of 2022. The data shows that the hashtag cloud and the word cloud were completely dominated by other health issues such as polio, diabetes, the Pink October campaign (Breast Cancer Awareness Month), and malaria.

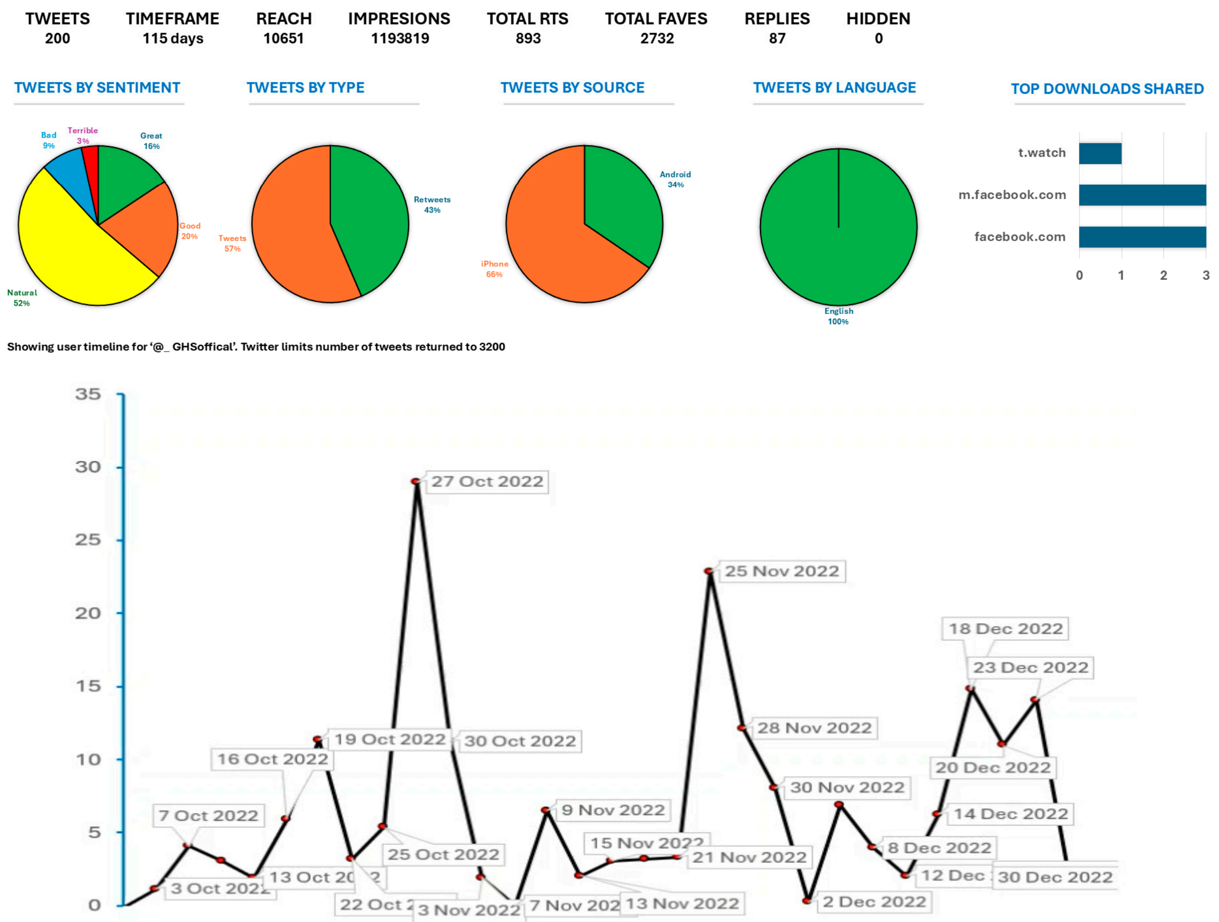

Figure 8. User Search and Analytics for "@_GHSoffical": Timeframe of 115 days.

Hashtags such as ***#pinkoctober, #helpkickolioooutofghana, #worldsightday, #worldaidsday, #breastcancerawareness, #worlddiabeteseday***, and ***#earlydetectionsaveslife*** were examples of the hashtags mostly used by the Ghana health service during this period, as shown below in Figure 9.

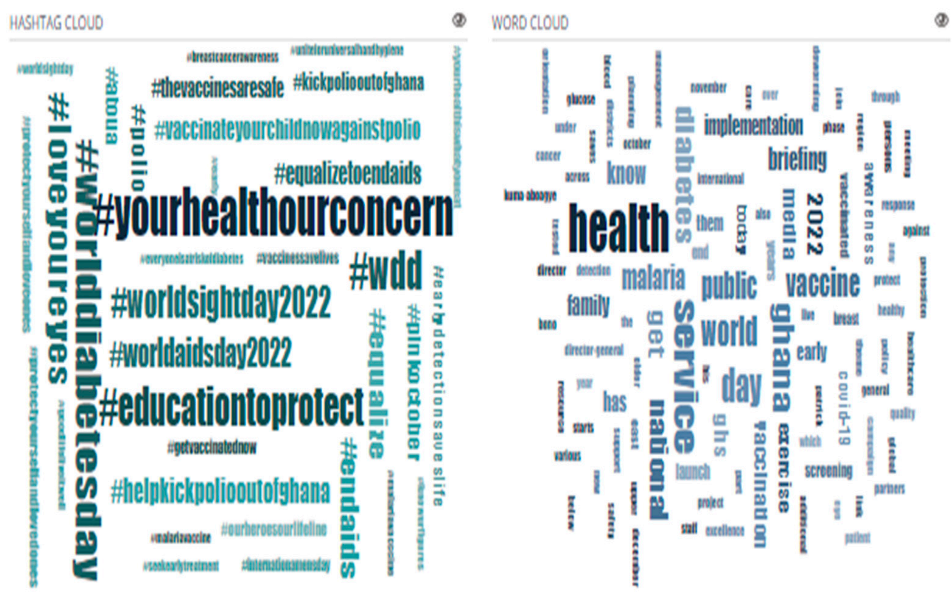

Figure 9. The most used hashtags and words. Timeframe of the above mentioned 115 days.

5. Discussion of the Results

Figure 3 shows the total number of COVID-19-related posts made each year, with 2021 being the period with the most COVID-19-related content. Despite the Twitter (X) account's creation in June 2020, the year 2020 recorded the least number of posts as they covered only just half a year (from July to the end of December 2020). Consequently, the chart indicates a drastic decrease in public health communication from 2021 to 2022.

There was a massive increase in public health communication against the virus in the third quarter of 2021, with the COVID-19 pandemic acting as a trigger for a rise in the nation's usage of Twitter (X) for health-related communication [82]. The government in Ghana gave great importance to communicating with its citizens through Twitter (X), which was not widely used in health institutions before, as there has been a qualitative shift since 2020 in the use of Twitter (X) in official health institutions.

Twitter (X) has become a vital tool for communication during the COVID-19 health crisis. Twitter (X) has played an important role in circulating information and updates related to the pandemic. Twitter (X) is an easy-to-use platform that healthcare organizations can influence through features such as hyperlinks that help retain users and drive followers by including links to the organization's blogs, social media pages, or other relevant resources [62]. Twitter (X) is a free microblogging social media website that, according to the Statista website [83], had approximately 237.8 million monetizable daily active users (mDAU) in Q2 2022. Twitter (X) offers features such as hyperlinks, which allow users to retain and increase their following by incorporating links to their website or social media profiles, as well as to news sources related to the organization [62]. It is concluded that it contributed positively to building dialogic relationships by enabling the health communication system in Ghana to communicate with citizens.

Using Twitter (X)'s reply feature or including another Twitter (X) users' @ symbol and username in the tweet, organizations can communicate with their followers. Anyone following the organization's account can see the replies, demonstrating its responsiveness and commitment to creating ongoing conversations [33]. This approach is cooperative for health organizations, as it permits them to be involved in debates about answering questions and health-related topics, as well as responding to concerns raised by their followers. Furthermore, it supports building relations with their followers and leads to credibility and increased trust. According to [49], organizations can use the retweeting function to share relevant and valuable information with their followers or to highlight their relationships with other organizations and people. Users can retweet any content to their own followers, according to [84].

Similar to previous studies on the importance of social media, particularly Twitter (X), in public health communication, the study found that GHS's tweets in the period of 3 years reached over 11,000 thousand users.

Regarding (RQ1), the SocialBearing application was effective in answering how often COVID-19-related issues were tweeted compared to other issues from 2020. This is an analytical detail of GHS showing the period, the word cloud, the hashtag cloud, the post, the tweets by sentiment, the reach, the impression, and all other necessary details regarding GHS on Twitter (X). As shown in Figure 4, as of the 829th day, which is an inclusion of the years 2022, 2021, and some months in 2020, the hashtag cloud and word cloud were dominated by hashtags and words relating to COVID-19.

By analyzing the hashtag cloud and the word cloud of the GHS Twitter (X) account in Figure 7 such as ***#zeromalariasstartsithme***, ***#kickpoliooutofghana***, ***#helpkickolioout-ofghana***, ***#vaccinateyourchildnowagainstpolio***, and ***#rollbackmalaria***, the study found that in the last quarter of 2022, other health issues like malaria, polio, breast cancer, diabetes, and hepatitis gained more social media coverage than COVID-19-related issues. Figure 5 also showed that COVID-related hashtags were the most used hashtags in this period such as ***#covid19isreal***, ***#stayalertandstaysafe***, ***#maskisamust***, ***#covid19***, and ***#thevaccinsaresafe***. Hashtags such as ***#pinkoctober***, ***#helpkickoliooutofghana***, ***#worldsightday***, ***#worldaids-***

day, ***#breastcancerawareness***, ***#worlddiabeteseday***, and ***#earlydetectionsaveslife*** were also examples of the hashtags mostly used by the Ghana health service during this period.

Twitter (X) has a limit of 280 characters per tweet, which supports highlighting messages communicated with text. Twitter (X) has important features that can help health institutions retain their audience and engage in dialogic communication. The vital feature of Twitter (X) is its competence in facilitating dialogic loops through certain mechanisms, such as reply feedback and retweeting. Regarding (RQ2), the results of this study suggest that users can establish a dialogue loop in which they exchange and verify information with one another by retweeting health messages related to COVID-19. Ref. [85] studied how Italian public institutions focused on health communication during different phases of the pandemic. They offered significant applicative opportunities in promoting general and specific awareness about health communication. In particular, the comprehension of persuasive cues, including health literacy.

Figure 5 shows that on the 397th day, which is an inclusion of the months in 2022 and the last two months of 2021, the hashtag cloud and the word cloud were both dominated by conversation relating to other health problems like malaria, hepatitis, polio, and diabetes. Also, Figure 7 shows data as of the 115th day, which included the last quarter of 2022. The data shows that the hashtag cloud and the word cloud were completely dominated by other health issues such as polio, diabetes, the Pink October campaign (Breast Cancer Awareness Month), and malaria.

Some Twitter (X) features that help health organizations effectively disseminate health information can also be beneficial; these features engage in meaningful dialogic communication with their audience. In health organizations, the inclusion of hyperlinks in blogs and other social media accounts can provide their followers with useful information and resources to encourage them to adopt healthy behaviors and lifestyle choices. The organization of the tweets will increase the audience, and they will benefit from the useful hashtags. In their paper, Ref. [42] argue that building credibility and trust can encourage increased audience participation in the dialogic loop.

Retweeting and other interactive Twitter (X) features have grown to be important tools for facilitating dialogic loops about health-related topics like COVID-19. Health communicators regularly shared original tweets, according to a Ghanaian study, but they varied in how they responded and retweeted. Retweeting conversations is a useful way to disseminate health-related information and encourage people to interact with public health messages.

Twitter (X) demonstrates an important forum for participating in conversation loops about health-related topics, such as COVID-19, because of its retweeting feature. The results show that Ghanaian health communicators tend to use the reply and retweet functions differently, but they tweet original content more frequently. In the digital age, retweeting others has become a standard method of interaction. Retweeting conversations has become a popular way to interact with content and express ideas, opinions, and reactions on social media platforms. Retweeting is a particularly useful technique for disseminating health-related information and encouraging interactions with public health messages.

Possibly even life-saving retweets are an effective way to spread health-related information and increase public awareness. Retweets enable users to disseminate accurate information from reliable sources while also allowing them to share their opinions and experiences. During the COVID-19 pandemic, retweets are likely to contain messages about surveillance, technical information, collective efficacy, self-efficacy, and symptoms [55]. This feedback loop will help dispel rumors and increase trustworthiness. Retweeting health-related content can start dialogue loops that encourage people to talk to each other and share their thoughts, concerns, and personal experiences. This will improve knowledge of the difficulties and effects of COVID-19 on different communities, which may have an impact on the creation of more fair and successful plans and interventions. Retweeting health-related topics like COVID-19 creates dialogue loops that increase public awareness and engagement, advance health literacy, and ultimately enhance public health outcomes.

6. Conclusions

Twitter (X) revolutionized crisis management, especially during the COVID-19 pandemic. Twitter (X) enables effective executive communication and the sharing of critical information among organizations, governments, and individuals. Twitter (X) 's succinct nature facilitates the rapid dissemination of information to large audiences. Public health agencies and governments use Twitter (X) as a tool to disseminate official announcements about COVID-19, updates on procedures to cover the spread of the virus, and guidelines to prevent infection.

The results showed that public health communications on COVID-19-related issues were tweeted compared to other issues from 2020. The users were able to establish a dialogue loop in which they exchange and verify information with one another by retweeting health messages related to COVID-19. Medical professionals and the public engage in dialogue on Twitter (X). Medical professionals took to Twitter (X) to answer questions from the public and clarify issues related to COVID-19. We also held Twitter (X) chats and virtual town hall meetings to facilitate discussion of COVID-19-related issues. During this time, various actors in Ghana's medical communication system, including government agencies, non-governmental organizations (NGOs), and medical professionals, have used Twitter (X) to disseminate information about COVID-19 to the public.

The fact that health ministries in countries such as Ghana began using Twitter (X) after the outbreak of COVID-19 highlights that the pandemic has prompted a shift in the use of digital communication tools in healthcare. Furthermore, it presents the impacts of COVID-19 on using and providing healthcare services, access to healthcare and health services, and public support for government measures to combat the pandemic. The Ghanaian government used Twitter (X) to communicate with the public about COVID-19, sharing updates on case numbers, precautions, treatments, containment, testing centers, vaccination programs, and other efforts to reduce the pandemic's impact. The Ghanaian government used Twitter to disseminate rapid information about the virus and where to get medical care. It allowed people to communicate directly with health institutions to ask questions or express concerns. Twitter helped to raise community awareness about the importance of adhering to health guidelines such as social distancing and wearing masks through large-scale awareness campaigns on the platform. It allowed citizens to hold health institutions accountable through open interactions.

7. Limitations

This study has limitations regarding the methodological part. The study took place in 2022. The same research questions could be answered differently in the research if it is done now. The time limitation of this study is from July 2020 to 31 December 2022 posts. Future studies could be conducted on a long span that could show more different results. As well as it is only studies one social media platform that other platforms could show other results. In addition, further research could be done on citizens' sentiments and how they have been impacted by communication via Twitter (X).

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