

Communication Patterns in Nigeria's COVID-19 Twitter Data

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Abstract

The human race has always been challenged with a myriad of illnesses and diseases. The recent outbreak of COVID-19 is however, highly unprecedented because of its rapid and wide spread across different countries of the world. Its rapid spread led to a series of immediate interventions including lockdown of socio-economic activities in many countries, including Nigeria. Many Nigerians adopted social media platforms as a ready tool for COVID-19 related communications. Twitter, one of the most prominent social media platforms, constitutes a source of huge data from which useful insights on citizens' behaviour during the pandemic could be generated. The present study, using data mining methods, sought to determine communication patterns in Nigeria's COVID-19 Twitter data. The study revealed, amongst others, that users were mostly engaged in retweeting. The study also found that only a few participants were very prominent actors in posting original tweets and also in being retweeted and getting direct mentions, among which were reputable media establishments, governmental and non-governmental organizations, and a number of high-profile individuals. The Nigeria Centre for Disease Control (NCDC), the apex Centre for disease control in Nigeria, is one of the most visible participants in Nigeria's Twitter communication on COVID-19. The study also revealed the

most prominent themes and sentiment polarity in Nigeria's COVID-19 Twitter data. The study recommends amongst others that the use of Twitter by relevant bodies to disseminate useful health information in emergency cases in Nigeria should be encouraged so as to provide useful information to satisfy people's needs in health and other safety critical events.

Keywords: COVID-19, Nigeria, Social media, Twitter, Data mining

Introduction

Health, they say, is wealth, and a healthy nation is a wealthy nation. No wonder then that health is centrally positioned in the 2030 Sustainable Development Goals Agenda (World Health Organization, 2016). While the human race has been challenged with a myriad of illnesses and diseases, the recent outbreak of COVID-19 has been highly unprecedented in the rapidity and spread around the world. In December 2019, a cluster of pneumonia cases were discovered in Wuhan, China. The disease, which was later found to be caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), was, within a few months, rapidly spreading around the world, leading to hundreds of thousands of cases in over 160 countries (Yi et al., 2020).

Nigeria was untouched until February 27, 2020 when the first case was announced. Prior to this date, many Nigerians regarded the disease as a white man's infirmity that could never reach them. However, as the number of COVID-19 cases gradually rose among the Nigerian population, uncertainty, palpable fear and misinformation regarding COVID-19 characterized the inhabitants of the country (Reuben, Danladi, Saleh, and Ejembi, 2020). A series of immediate interventions were put in place by the government of Nigeria, such as an immediate international travel ban, closure of educational institutions, and a ban on mass gatherings (Adegboye, Adekunle and Gayawan, 2020). During the lockdown, the social media was one of the major means to search and share information on COVID-19 and its related issues.

Social media has been a key avenue for creating and spreading health information (Adebimpe et al., 2015). Social media platforms have also been found useful for real-time public health communications

(Boulos, Hetherington, and Wheeler, 2007). Twitter, one of the most prominent social media platforms, was launched in 2006. In the early years, seasoned journalists viewed Twitter with skepticism and disdain (Smith and Gallicano, 2015; Hermida, 2010). The platform, which later rose to prominence between 2008 and 2009 (Ediger et al., 2010), has now become a popular platform for Web users to communicate with one another, particularly during extreme events.

Twitter use during extreme events has drawn attention of researchers and practitioners, leading to a growing body of literature on Twitter use for crisis communication (Pourebrahim et al., 2019; Caragea, Squicciarini, Tapia, and Stehle, 2017; Cheong and Cheong, 2011; Muralidharan, Rasmussen, Patterson, and Shin, 2011; Acar and Muraki, 2011; Sreenivasan, Lee, and Goh, 2011; Heverin and Zach, 2010; Stella, Restocchi and De Deyne, 2020; Singh et al., 2020). The COVID-19 pandemic is one of the extreme events in recent times. Its emergence and rapid spread made it a dominant topic on Twitter from March 2020. A study of Twitter usage among leaders of the United Nations' member states during the pandemic revealed that there were significant percentage increases in Twitter followers of the leaders who frequently tweeted; indicating citizens' interest in seeking COVID-19 related information from respected sources via social media networks (Haman, 2020).

A number of studies have been carried out on the use of Twitter during the recent corona virus pandemic in different parts of the world (Stella, Restocchi and De Deyne, 2020; Singh et al., 2020; Ferrara, 2020; Haman, 2020). In Nigeria, Twitter is one of the ready tools facilitating the avalanche of information flow on the COVID-19 pandemic. Twitter therefore constitutes a huge source of data from which useful insights on citizens' behaviour could be generated. However, while the COVID-19 pandemic in Nigeria has attracted researchers from different fields (Reuben, Danladi, Saleh, and Ejembi, 2020; Adegboye, Adekunle, and Gayawan, 2020), no known study has investigated the use of Twitter for COVID-19 pandemic communication in the country. The present study therefore, seeks to determine the communication patterns in Nigeria's Twitter data on COVID-19.

Research objective

The broad objective of this study is to determine communication patterns in Nigeria's COVID-19 Twitter data. Specifically, the study seeks to determine the levels of activities, users' commitment, prominent personalities, prevalent words and sentiment polarity in Nigeria's COVID-19 Twitter data. To achieve the study's objective, the following research questions were investigated.

Research questions

1. What are the levels of occurrence of the different types of tweets on the COVID-19 pandemic in Nigeria?
2. What are the levels of involvement of users in Nigeria's COVID-19 pandemic Twitter activities?
3. Who are the prominent authors of Nigeria's COVID-19 tweets?
4. Who are the most visible, retweeted authors in #COVID19Nigeria tweets?
5. Who are the most discussed personalities in Nigeria's #COVID19Nigeria data?
6. What are the most discussed themes in #COVID19Nigeria contents?
7. What is the distribution of sentiments in #COVID19Nigeria tweets?

Literature Review**Twitter as a veritable social media tool**

Social media are people-centered Web technologies that provide online environments for those with common interests to establish themselves into social networks through which they can team up and amass their collective intelligence (Murugesan, 2007). Twitter, a microblogging service, is one of the most popular social media technologies which combine properties of social networking, content production with information sharing (Hermida, 2010). Launched on July 13, 2006, Twitter is a simple service, through which users communicate by sending short messages limited to 140 characters, known as tweets, to a network of allies (followers) from different types of digital devices (Ediger et al., 2010).

Twitter's early years witnessed skepticism and disdain from experienced journalists who were concerned about the capability of this conversational tool to function as a networked space for serious public discourse. Most were of the opinion that Twitter merely unleashed a deluge of worthless information on users (Smith and Gallicano, 2015; Hermida, 2010). Twitter however, overcame these early challenges as it rose to prominence in the years 2008 and 2009, majorly, due to its adoption by high profile public figures, particularly in the US, UK and Australia (Ediger et al., 2010). Twitter's emergence as a significant form of communication was demonstrated when the US State Department requested Twitter to delay its routine maintenance during the Iranian polls (Hermida, 2010).

Twitter has now become a ready tool for communication on different aspects of human endeavour. As of the fourth quarter of 2019, Twitter had 330 million monthly active users, 145 million daily users, 500 million tweets sent each day and 6,000 tweets every second (Brandwatch, 2020). The compact and fast nature of tweets, multiplatform input method, combined with the rise of smart phones and their integration into daily life patterns have increasingly contributed to wide usage of Twitter. Twitter is now a ready communicative tool that is used to coordinate events and enable collaboration among users with common interests and goals. It is also used to spread and share breaking news, personal updates and spontaneous ideas (Chiluwa and Adegoke 2013).

Twitter is becoming a valuable tool in disaster and emergency situations (Cheong and Cheong, 2011; Chiluwa and Adegoke 2013). This has led to wide usage of the tool for sharing first-person observations in emergency situations or relevant knowledge from external sources (Cheong and Cheong, 2011). The wide usage of this communicative tool during extreme cases has drawn the attention of researchers, leading to a growing body of literature on the use of Twitter for crisis communication. The use of Twitter during a number of natural and human disaster has been studied. Examples include the Hurricane Sandy crisis (Pourebrahim et al., 2019; Caragea et al., 2017), the Australian Queensland and New South Wales and Victorian 2010-2011 floods (Cheong and Cheong, 2011), the Haitian earthquake (Muralidharan et al., 2011), the Great Tohoku earthquake (Acar and Muraki, 2011), the Icelandic volcano eruption (Sreenivasan, Lee, and Goh, 2011), the Seattle-Tacoma, Washington

shooting of late November 2009 (Heverin and Zach, 2010), Nigeria's Boko Haram insurgency (Chiluwa and Adegoke, 2013); and the recent corona virus pandemic (Stella, Restocchi and De Deyne, 2020; Singh et al., 2020; Ferrara, 2020; Haman, 2020).

These studies have been able to produce useful knowledge from different research perspectives such as analyses of keywords and sentiment polarity of tweets (Pourebrahim et al., 2019; Caragea et al., 2017), investigation of communication patterns (Singh et al., 2020) and diverse user studies (Muralidharan et al., 2011; Cheong and Cheong, 2011; Haman, 2020).

Methodology

Research design

The research method adopted by the present study is data mining methods. According to Romão, Moro, Ritac and Ramos (2019), the uniqueness of social media data requires the use of data mining techniques that are able to effectively extract and analyse user-generated content. To achieve the objective of the study, a preliminary search was carried out to identify some hashtags that emanated from the use of Twitter for COVID-19 communication in Nigeria. While there were many, #COVID19Nigeria was selected for the present study because of its huge user base.

Data collection was carried out using the Twitter widget Orange data mining tool. Orange is a comprehensive, component-based software suite for machine learning and data mining, developed at Bioinformatics Laboratory, Faculty of Computer and Information Science, University of Ljubljana, Slovenia, together with open source community (University of Ljubljana, 2020). Tweets were collected by using the Twitter Search API on the Orange data mining tool, using the hashtag (#COVID19Nigeria) as the query, while the search widget field was set to 'Content'. In order to allow for relatively high level of retrieval on each hashtag, data were collected between the 12th of April and the 9th of May at four instances; on the 12th and 23rd of April, and on the 1st and 9th of May 2020.

Twitter data, after collection, were first saved in separate Excel files, after which all corpora on hashtag were merged into a single Excel

file. Data cleaning was carried out by removing duplicate tweets from the dataset. Data analysis comprised two main parts; frequency distribution analysis and textual data mining. The first part entailed the use of Microsoft Excel 2013 to determine frequencies and charts. The second part entailed the use of the Orange data mining tool for textual data mining purposes.

Results

Different tweet types on Nigeria’s COVID-19 pandemic

Figure 1 presents activity metrics of the different tweet types (original tweets, retweets and @responses). The figure also shows the number of unique authors, unique retweets and unique @responses contained in the dataset.

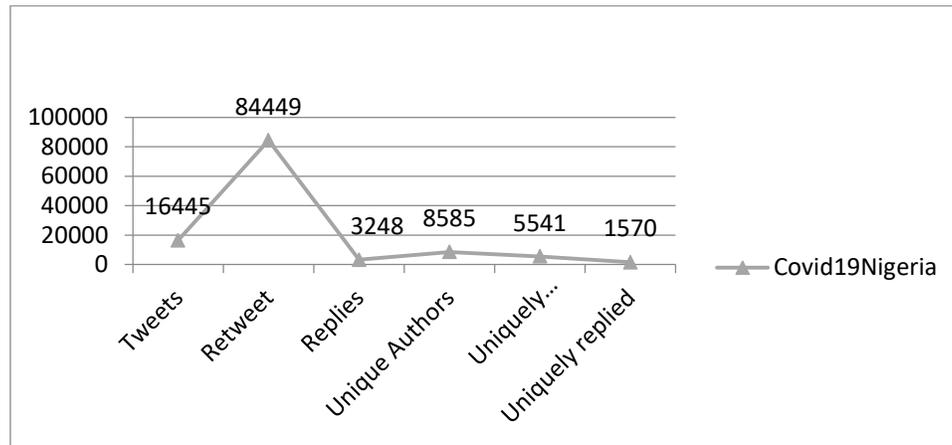


Figure 1: Metrics of the different tweet types #COVID19Nigeria.

As shown in Figure 1, #COVID19Nigeria had a total of 16,445 original tweets, 84,449 retweets, and 3,248 @replies. Furthermore, the number of unique authors, uniquely retweeted and uniquely replied are 8,585, 5,541 and 1,570 respectively. As revealed by these results, sending out retweets was the most prevalent activity in the hashtag community, followed by posting of original tweets and last was direct mentioning @responses. Also, the number of unique authors was higher the uniquely

retweeted and the uniquely replied participants in the hashtag community.

Levels of users’ participation in each Twitter activity

Figures 2a - 2c present the distribution of users’ participation in posting original tweets, being retweeted and then being mentioned through direct @responses.

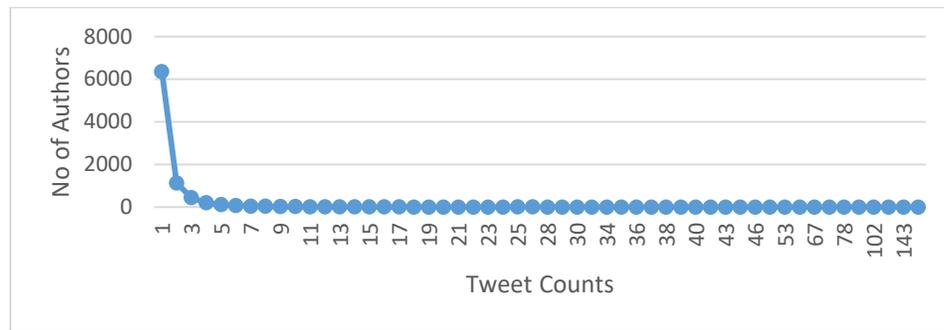


Figure 2a: Authorship distribution of original tweets.

As shown in Figure 2a, few authors contributed significantly to the posting of original tweets. Only one author each posted forty and above original tweets while six thousand, three hundred and forty five (6,345) authors posted only one tweet each.

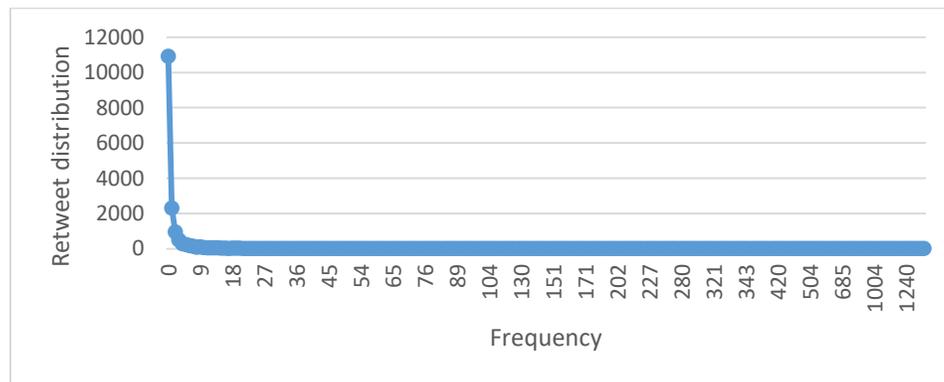


Figure 2b: Distribution of number of retweeted authors.

Figure 2b shows that only a few authors' tweets were retweeted significantly. Ten thousand, nine hundred and four tweets were not retweeted at all, two thousand three hundred and one tweets were retweeted only once while only one tweet each had eighty-one and above retweets.

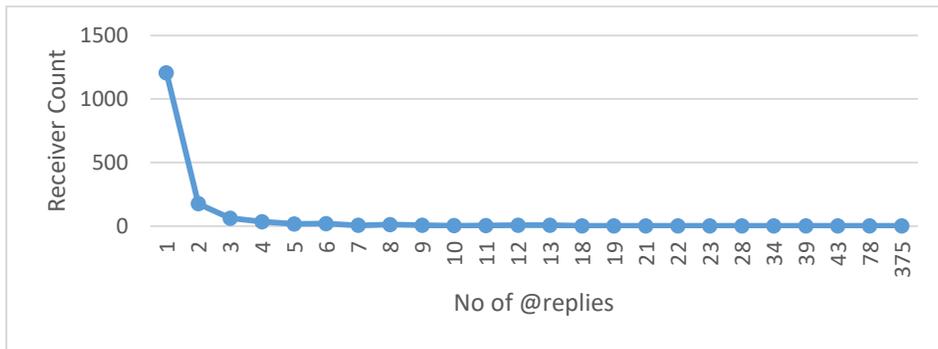


Figure 2c: Distribution of number of directly mentioned authors.

The results presented in Figure 2c show that only a few personalities had significant direct mentions in the Twitter communications in Nigeria's COVID-19 corpus. As revealed in the figure, while one thousand, two hundred and six personalities were mentioned only one time each, and one hundred and seventy six were mentioned twice each, only one personality each received twenty three and above direct mentions in the Twitter corpus.

Prominent authors in Nigeria's COVID-19 tweets

To determine the most prolific authors, tweets were divided into ten parts. The most prolific authors were the fewest number of authors who produced the first 10% of tweets in the Twitter corpus. Table 1 presents these prominent authors, their description, the account type and the number of tweets contributed.

Table 1: Prominent authors in #COVID19Nigeria

| S/No | Author | Description | Account Type | No of Tweets |
|------|-----------------|---|--------------|--------------|
| 1 | eienigeria | Network of young Nigerians promoting good governance and citizen engagement | Corporate | 164 |
| 2 | ncdcgov | Official Twitter account of the Nigeria Centre for Disease Control (NCDC) | Corporate | 102 |
| 3 | saharatv1 | Independent media enterprise, journalism outlet | Corporate | 79 |
| 4 | trafficbutter | Helping people avoid traffic in Nigeria & delivering crucial information to people quickly | Corporate | 78 |
| 5 | coolradio93 | Radio station | Corporate | 56 |
| 6 | hotnewsnaija | News as it breaks | Corporate | 53 |
| 7 | legitngnews | News | Corporate | 53 |
| 8 | citizenshealthn | Promoting citizens' rights to accessible, available, acceptable and quality healthcare to improve health and social wellbeing #RightToHealth #StayAtHomeNigeria | Corporate | 44 |
| 9 | leads_nigeria | #CommunityDevelopmentCharter, KadunaLGElection2018 | Corporate | 44 |
| 10 | stunishnews | Providing high-quality content | Corporate | 43 |
| 11 | channelstv | Independent television station currently broadcasting | Corporate | 42 |
| 12 | noa_nigeria | Official twitter account of the National Orientation Agency (NOA) | Corporate | 40 |
| 13 | outcomenews | Online newspaper | Corporate | 39 |
| 14 | allafrica | News and information from the fast-changing continent. | Corporate | 38 |
| 15 | radionigeriahq | The Federal Radio Corporation of Nigeria, the pioneer broadcast station | Corporate | 37 |
| 16 | newsdph | Nigeria's leading magazine in the fight against gender-based violence | Corporate | 36 |

| S/No | Author | Description | Account Type | No of Tweets |
|------|-----------------|--|--------------|--------------|
| 17 | spotlight4ta_ng | Empowering and working with rural communities | Corporate | 36 |
| 18 | fireworkswithtb | A platform showcasing Africans in the UAE | Corporate | 35 |
| 19 | c19nigeria | Providing statistical data and news about COVID19 | Corporate | 67 |
| 20 | osee80 | I came, I saw n conquered | Individual | 143 |
| 21 | naijatoptweet | Story Teller, Avid Reader | Individual | 103 |
| 22 | mndukwe | Strategist, Telecoms & Digital Services Senior Management Professional, Programmer, Data Scientist/Analyst, DJ & music lover, Biz owner, Super Dad & husband | Individual | 75 |
| 23 | ba55ey | Photo-journalist | Individual | 48 |
| 24 | mayubeku | Public Health Professional and Epidemiologist. | Individual | 46 |
| 25 | omojuwagem | Molecular Biologist, Microbiologist, Teacher, Writer, Passionate Lover of God, Music Lover, Investment Consultant | Individual | 46 |
| 26 | sama_on_point | Patriotic Nigerian. Genuine Comrade. Good Follower. Better Leader. Skillful Footballer. Proud Muslim. IG: sama_on_point | Individual | 39 |
| 27 | ncdc_nigeria | | NA | 38 |

*NA- Not Available

As shown in Table 1, nineteen out of the twenty-seven Twitter accounts of prominent authors were affiliated to corporate organizations. Most of the affiliated corporate bodies are reputable media organizations, or governmental and non-governmental bodies. The descriptions of the prominent individual accounts depict their interests and vocations, among which are journalism, information technology, biological sciences, and entertainment.

The most prominent authoring corporate account is @eienigeria, a network of young Nigerians promoting good governance and citizen

engagement. This is followed by @ncdcgov, the official Twitter account of the Nigeria Centre for Disease Control (NCDC). The third most prominent corporate author is @saharatv, an independent media enterprise and journalism outlet. The most prominent individual author is @osee80, followed by @naijatoptweet and then @mndukwe. The overall most prominent author is @eienigeria (164 tweets) followed by @osee80 (143 tweets).

Most Visibly Retweeted Authors

Figure 3 presents the topmost 1% authors with the highest number of tweets that have been retweeted. These few authors account for a total of 44.97% of the total number of retweets in the corpus.

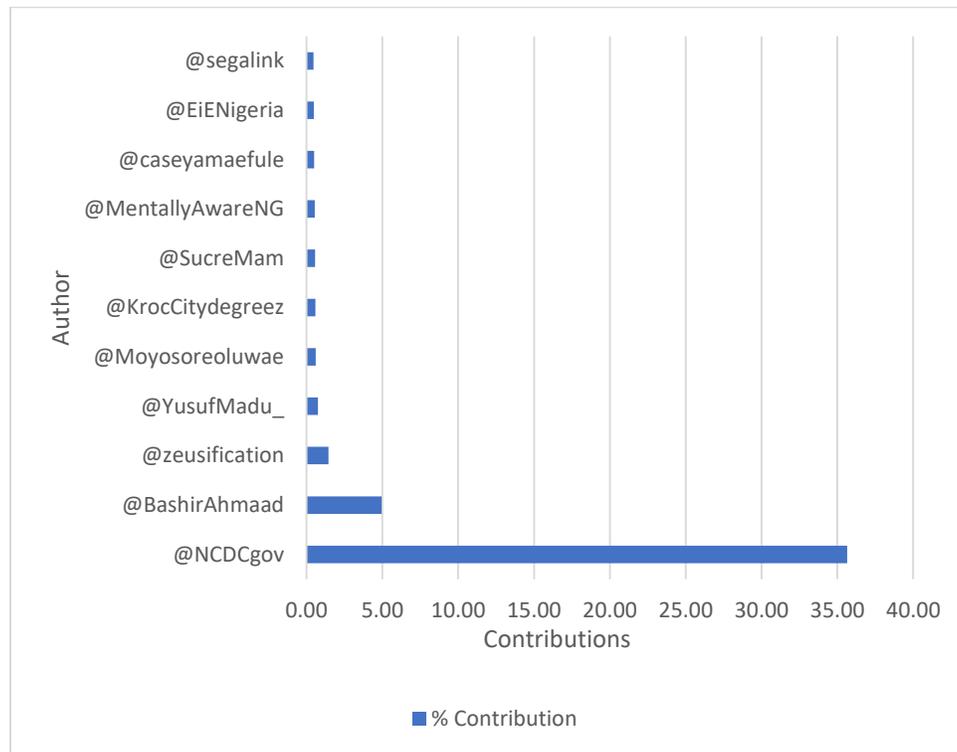


Figure 3: Most visible (retweeted) authors.

Figure 3 shows that @ncdcgov, the official Twitter account of the Nigeria Centre for Disease Control (NCDC), is the most visible participant based on the number of retweets received. This is followed by @BashirAhmaad, Personal Assistant on News Media to @MBuhari, President of the Federal Republic of Nigeria. This is followed by @zeusification, affiliated to a music producer's individual account.

Most prominent authors with direct mentions

The topmost 1% authors that have been mostly mentioned are as presented in Figure 4. These topmost 1% @mentions accounted for 21.77% of all direct mentions.

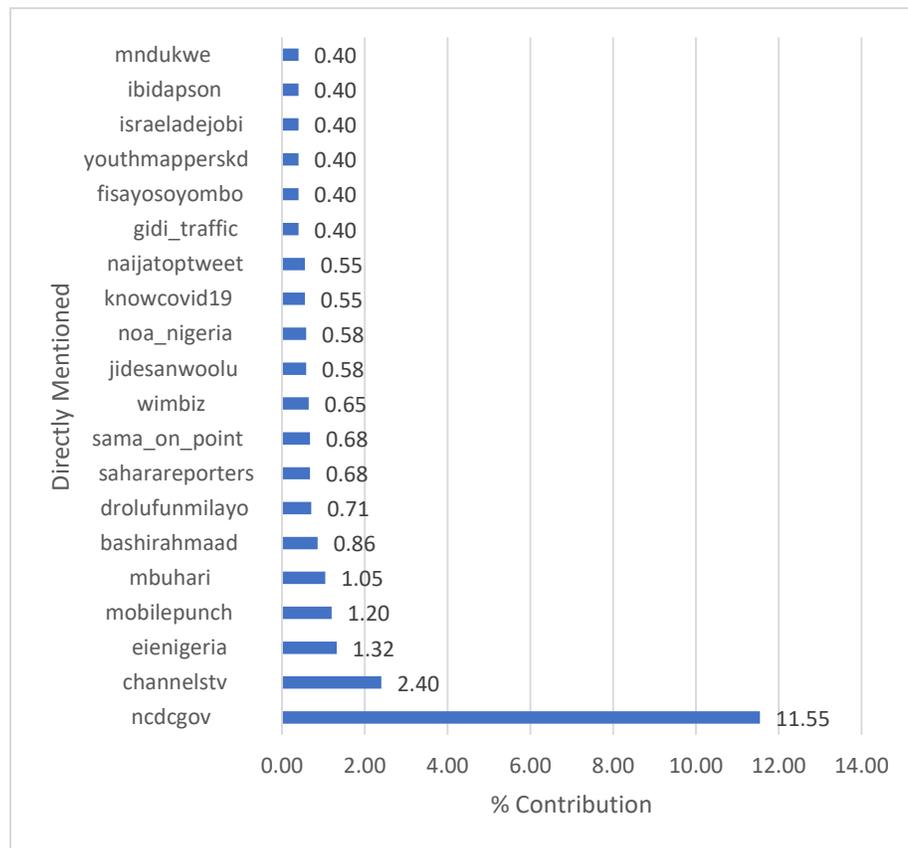


Figure 4: The most prominent authors with direct mentions.

Sentiment analysis of #COVID19Nigeria tweets

Sentiment analysis classifies tweets based on their emotionality. The distribution of sentiments in the Twitter corpus in the present study is as presented in Figure 6.

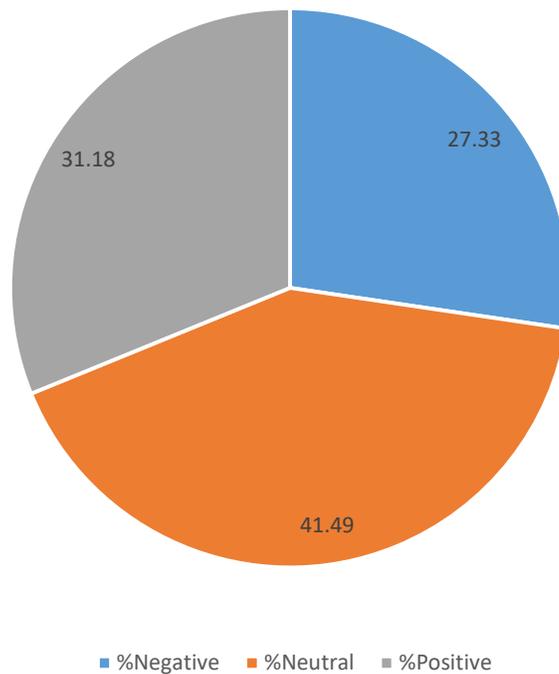


Figure 6: Sentiment distribution of tweets in #COVID19Nigeria.

Figure 6 shows that most of the tweets had neutral emotional polarity (41.49%). This is followed by tweets with negative emotion (31.18%) and lastly by those with positive emotion (27.33%).

Discussion of Findings

The analysis of Twitter data on the Covid-19 pandemic in Nigeria has produced a number of useful findings. The study revealed that the most prominent user activity on #COVID19Nigeria is retweeting, followed by posting of original tweets and then by direct mentions. This finding is similar to the pattern discovered in previous emergent events reported by Bruns and Stieglitz (2012). According to them, hashtags

which saw a substantial amount of retweeting, and comparatively few original tweets, largely fall into the category which may be best described as 'breaking news' or 'rapid information dissemination'. These are hashtags related to natural disasters (such as #earthquake and #tsunami #qldfloods) and civil unrest (such as #libya, #occupywallstreet, #riotcleanup). This portrays users' gate watching role and their readiness to actively disseminate Twitter messages they have received to others in such emergency cases as the COVID-19 pandemic.

The study also found that only a few participants were accountable for significant commitments across the three tweet types (original tweets, retweets and direct responses). This supports the assertion of power laws (such as Zipf's law and Pareto law) that a larger proportion of resources are created by only a few actors. The finding also corroborates the finding of Bruns and Stieglitz (2013) in their report of the most active and most visible contributors in the #qldfloods hashtag, which covered the January 2011 floods in south-east Queensland, Australia, that a handful of leading users are disproportionately active or visible by comparison with the vast majority of their peers.

Analyses of the most prominent participants across the three activities revealed that the prominent participants in Nigeria's COVID-19 tweets included reputable media establishments, governmental and non-governmental organizations, and a number of high-profile individuals. The prominence of the Nigeria Centre for Disease Control (NCDC), the apex centre for disease control in Nigeria, is particularly outstanding, being the most discussed and also the highest retweeted Twitter account. The prominence of such calibre of accounts in the hashtag community shows that Nigerians were actually looking out for information from reputable sources. This finding is similar to the submission by Bruns and Stieglitz (2013), that the most visible users in the #qldfloods hashtag were accounts of major news or emergency organisations, led by the Queensland Police Service (@QPSMedia). This also shows the important role of Twitter as a platform for meeting users' information needs for safety and health in critical situations.

The word cloud shows the prominent themes discussed on #COVID19Nigeria. The most prominent themes are on Covid-19 issues such as information on update on cases, the issue of lockdown, discussion

on the most affected states in the country, among others. According to Katz (1996), the number of instances of any specific content word in a particular document is a function of the extent of the document's relevance to the word and the concept expressed by the word. Our finding therefore shows the relevant themes in the #COVID19Nigeria corpus, which also reflects users' concerns about COVID in Nigeria. The sentiment analysis shows that most tweets reflected neutrality in the expression of the emotion of users. This, however, was followed by tweets that reflected negative emotion and lastly by those that showed positive emotion. This finding could be as a result of a mix of uncertainty and despondency associated with the COVID-19 pandemic. Nigerians are a highly optimistic and resilient group of people, the terrible nature of the COVID-19 pandemic might have made them to show more negative than positive emotion in their tweets.

Limitation of the Study

The present study was based on Twitter communication on #COVID19Nigeria only. There are many other corona virus-based hashtags. The selected hashtag however, had the highest user base and the methodology of its selection is in consonance with some previous related studies, like Heverin and Zach (2010).

Conclusion

From the findings of this study, it could be concluded that users engage more in retweeting than in posting original tweets on Nigeria's COVID-19 Twitter communications contained in #COVID19Nigeria. Committed accounts based on the number of original tweets posted and prominent and visible personalities based on the number of retweets and direct mention received were significantly fewer than the remaining participants in the hashtag community. The study also shows that the prominent and visible personalities are mostly comprised of reputable sources of information in Nigeria, such as the Nigeria Centre for Disease Control, and media houses. Themes discussed were relevant to COVID-19 in Nigeria and crucial to people's information needs on the pandemic. Tweets on COVID-19 in Nigeria, though mostly neutral, also had a considerable proportion of negative emotions.

Recommendation

Based on the findings of the present study, it is recommended that:

1. Twitter should be used by relevant bodies to disseminate useful health information in emergency cases in Nigeria. This will help to provide useful information to satisfy people's needs during health and other safety critical events.
2. Researchers should study Twitter and other social media usage in periods of public health crisis. This will help to create further insight into people's behaviour and needs during such periods.

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