

2019-nCoV Disease Control and Rehabilitation: Insights from Twitter Analytics

Naganna Chetty
School of Management
National Institute of Technology
Karnataka, Surathkal
Mangalore, India
nsc.chetty@gmail.com

Sreejith Alathur
School of Management
National Institute of Technology
Karnataka, Surathkal
Mangalore, India
sreejith.nitk@gmail.com

Vishal Kumar
Dept. of Computer Science & Engg.
Bipin Tripathi Kumaon Institute of
Technology, Dwarahat
Almora, India
kumarvishalji@gmail.com

Abstract— Coronaviruses are the large family of viruses and life threatening with the capabilities to cause respiratory related diseases. The current outbreak of 2019-nCoV (novel Coronavirus) is challenging governance authorities and health care systems around the globe. The epidemic of 2019-nCoV is affecting people globally. The purpose of this paper is to examine the current status of disease control and rehabilitation in relation to outbreak of 2019-nCoV. In this regard, the Twitter social media contents are collected, analyzed and interpreted. Using a set of appropriate keywords, 110000 tweets are extracted from Twitter social media. The collected tweets are first pre-processed and then analyzed with a software developed in R language. The discussions on social media in relation to the outbreak of 2019-nCoV involves disease control, rehabilitation and anti-rehabilitation. Expressions involving specific locations revealed that the discussions are more oriented towards anti-rehabilitation than rehabilitation and disease control. The content analysis also revealed that the outbreak epidemic victimizes those who possess weaker immune system.

Keywords— *Coronavirus, disease control, rehabilitation, 2019-nCoV, persons with disabilities, social media*

I. INTRODUCTION

In December 2019, in China, there was an outbreak of a disease which is named as 2019-nCoV (novel Coronavirus) by world health organization [1]. 2019-nCoV is a respiratory related illness with symptoms like fever, cough and shortness of breath [2]. Coronavirus is a kind of virus and prevalent in species like camels, cattle, bats and cats. As on 30 January 2020, 7818 confirmed cases of 2019-nCoV are reported globally involving 19 countries [3]. Five days later on 5 February 2020, the epidemic of 2019-nCoV is affected 24,363 people globally including China, United States of America and India [4]. Currently, 2019-nCoV is a global issue by spreading in 18 countries with 83 infected cases excluding China [5].

Though the 2019-nCoV reported cases are associated with seafood market in China, the actual source of the outbreak is still unknown [2]. Towards the control of disease, health authorities of China are trying their best. They identified the virus immediately and shared the genome sequence of the virus with WHO to assist other countries in conquering the coronavirus outbreak [5]. As part of the 2019-nCoV prevention and control, the countries insisted travel guidance to their citizens and equipped with necessary infrastructure to identify and provide treatment for the outbreak. To conquer with outbreak epidemic, the international community has planned to focus on rapid international coordination, readiness of each country and priority research [4].

Social media platforms can be used by healthcare practitioners to engage their users in exchanging the information about diseases and control [6]. The dissemination of disease related information by the users of social media is increasing exponentially. For instance, within a week of nCoV outbreak, we were able to capture 110000 tweets from Twitter social media. Therefore, this paper attempts to capture the social media content, analyse it and interpret the results towards an outbreak.

II. LITERATURE REVIEW

Human coronaviruses (HCoVs) are of six types and causes respiratory problems to patients [7]. Often, Middle East respiratory syndrome coronavirus (MERS-CoV) is affecting lives in different parts of the world [8]. Health care workers are worried about the risks of infections of the outbreaks. The concerned governing authorities should provide psychological support to health care workers to counter the outbreak [8].

When a new communicable disease affects the citizens, concerned government and healthcare workers should be courageous and courteous towards the victim of the virus. To manage unexpected incidents, the knowledge and positive attitudes towards outbreak like Coronavirus are essential to health care workers [9]. Preventive services play an important role in controlling diseases and saving lives. Accessibility, cost and awareness may be the obstacles to receive preventive services [10]. The social media can be used as a platform to provide awareness about the diseases, particularly on outbreaks. In this way, social media services may act as the life saver by supporting sharing of information among the users.

Detection of disease and being responsive at the right time are necessary to control disease. Internet based digital data plays an important role monitoring public health [11-12]. Sharma et al. analysed Facebook posts on Zika virus and identified that posts on misinformation gained more popularity than the actual and relevant posts [13]. The public discourse on a particular disease epidemic updates knowledge of healthcare workers [14]. Social media amplifies the fear factor during health crisis than the traditional media [15].

III. METHODOLOGY

As a part of methodology, first we collected the Twitter data immediately after the report of a confirmed 2019-nCoV case in India. The set of keywords related to 2019-nCoV disease are used in extracting the tweets form Twitter social media through its application programming interface (API). Querying Twitter social media on a recent outbreak resulted in 110000 tweets which involves the discussion on 2019-nCoV.

Though the Twitter content contain total of 16 attributes, we emphasized only on text part of the content as the respondents' opinions lies in the text. The collected tweets are first passed through the pre-processing stage for retaining only appropriate information. Pre-processing involves different tasks such as removal of punctuations, URL addresses, whitespaces, conjugate words and stemming. Pre-processed tweets are then analysed for sentiments of the respondents in relation to 2019-nCoV. The tweets are also analysed for association among the frequent words through adjacency matrix and network graph..

IV. RESULTS AND DISCUSSION

A software is developed using R programming language and it's interface RStudio to obtain results of analysis. The technique developed for sentiment analysis is applied on pre-processed Twitter content. The sentiment of the whole Twitter content in terms of different emotions is shown in Fig. 1.

Post epidemic of an outbreak, people expect its control and rehabilitation to lead normal life. The negative score value of the content indicates that the rehabilitation task by concerned authorities to bring back normalcy to life is not adequate. On the other hand, the positive score value indicates that the rehabilitation task is taking place and people are happy. The score values of different emotions collectively, indicates their neutrality towards 2019-nCoV outbreak, which in turn represents disease control.

The wordcloud of the tweets is shown in Fig. 2. The wordcloud depicts different emotions and their associated words with varying fonts and colours. The frequency of the word "death" indicates that the death is an extreme impact of the 2019-nCoV outbreak and is surprising one.

The adjacency matrix for frequent words in Twitter content is shown in Table 1. In the adjacency matrix, the

principal diagonal elements indicate frequency of occurrence of words and the rest of the elements indicate the frequency of co-occurrence. Association matrix depicts that the terms "Coronavirus", "2019ncov" and "virus" are more associated with the terms "China" and "Wuhan". Similarly, the word "outbreak" is associated with the terms "coronavirus" and "China". The expression of the words "China" and "Wuhan" in association with coronavirus indicates that the discussion on social media about the outbreak is more oriented towards the anti-rehabilitation than the rehabilitation and disease control.

The association among the popular terms which are used to dissipate information on the outbreak of 2019-nCoV over Twitter social media is shown in Fig. 3. In the graph, the vertices represent frequent terms in the discussion and edges represent the association among the terms. The term coronavirus is the most frequent term in the discussion on an outbreak and situated at the middle in the graph.

The content analysis of tweets reveals that the impact of outbreak epidemic is severe on children, older persons and persons with disabilities. For instance, a tweet "Elderly, children and persons with weak immune system are more prone to #coronavirus. Pay attention to the symptoms" indicates that elder persons, children and those who have compromised immune system are more vulnerable coronavirus like outbreak. The tweet also suggests to be alert and monitor the symptoms. Other tweet "Groups susceptible to the novel #coronavirus include children and pregnant women, China's central government announced Sunday", highlights the vulnerability of children and women during pregnancy. Another tweet "Disabled people 4x more likely to be injured/killed in disasters due to lack of inclusive planning & response" highlights exclusively, the vulnerability of persons with disabilities.

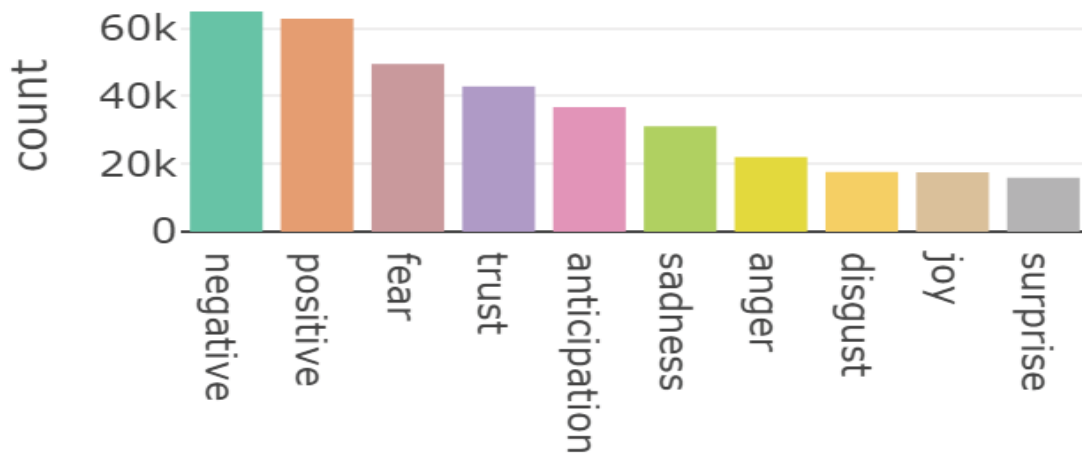


Fig. 1 Emotional sentiments on 2019-mCoV

Apart from the direct victimization (affected by the outbreak), the persons with disabilities face indirect victimization. For instance, a tweet “Disabled Chinese boy dies alone while family quarantined for #coronavirus #worldnews” depicts that while family members are affected by the outbreak, the person with disabilities could not lead the life as there is no one to take care. Other tweet “#Coronavirus tragedies: This is one of the saddest. Disabled teenager in China dies at home alone after his fath...” also reveals similar situation for person with disabilities like in previous tweet. Another tweet “We are not dying of #coronavirus UK, Sick and disabled people die starvation Alone and in despair” indicates that the persons with disabilities compromise with life because of starvation during the outbreak.

V. CONCLUSION

As human coronaviruses cause respiratory problems, their impact is deeper on the victims. The 2019-nCoV is a recent outbreak, originated in China and gained international attention by spreading exponentially. The outbreak posed a challenge to governments and healthcare organizations globally. Within the span of a month, the outbreak affected significantly and covered most portion of the globe. As the symptoms and impacts of 2019-nCoV are similar to existing human coronaviruses group, it may be added to the group in future.

The opinions of Twitter social media on the outbreak of 2019-nCoV involves disease control, rehabilitation and anti-rehabilitation. During the analysis of the results, it has been observed that most of the expressions involve specific locations. The presence of location in the tweets indicates that the discussion is oriented towards anti-rehabilitation than rehabilitation and disease control. The presence of negativity in the discussions on social media demands a kind of education to social media users about online behaviour. The content analysis also revealed that the outbreak epi-demic victimises those who possess weaker immune system such as children, elders and persons with disabilities. The governments in association with the healthcare works should plan and execute programs which strengthens immune system of the persons.

The 2019-nCoV epidemic posed direct and indirect threats to persons with disabilities. As the caretakers are affected with outbreak, the persons with disabilities could not manage their daily activities including food intake. Eventually, the lack of food and other necessary amenities claimed the lives of persons with disabilities. Therefore, the concerned governments while treating outbreak victims, should take care of victims’ dependents, particularly the persons with disabilities. With this act, the rehabilitation of persons with disabilities may be attained.

The current study considered only the Twitter social media for analysis on an out-break. In future, the analysis on outbreaks can be made by emphasizing the discussions on more than one social media platforms.

ACKNOWLEDGMENT

This paper work is supported by funding from Impactful Policy Research in Social Science (IMPRESS), Ministry of Human Resource Development (MHRD) Govt. of India–ICSSR.

REFERENCES

- [1] Hui, D. S., Madani, T. A., Ntoumi, F., Kock, R., Dar, O., Ippolito, G., ... & Petersen, E.: The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health-The latest 2019 novel coronavirus outbreak in Wuhan, China. *International journal of infectious diseases: IJID: official publication of the International Society for Infectious Diseases*, 91, pp. 264-266, 2020.
- [2] Gralinski, L. E., & Menachery, V. D.: Return of the Coronavirus: 2019-nCoV. *Viruses*, 12(2), pp. 135, 2020.
- [3] WHO: Novel Coronavirus(2019-nCoV) Situation Report – 10, https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200130-sitrep-10-ncov.pdf?sfvrsn=d0b2e480_2, last accessed 2020/01/30.
- [4] WHO: US\$675 million needed for new coronavirus preparedness and response global plan, <https://www.who.int/news-room/detail/05-02-2020-us-675-million-needed-for-new-coronavirus-preparedness-and-response-global-plan>, last accessed 2020/02/05.
- [5] WHO: Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV), [https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-\(2005\)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-\(2019-ncov\)](https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)), last accessed 2020/01/30.
- [6] Heldman, A. B., Schindelar, J., & Weaver, J. B.: Social media engagement and public health communication: implications for public health organizations being truly “social”. *Public health reviews*, 35(1), pp. 13, 2013.
- [7] Mutair, A. A., & Ambani, Z.: Narrative review of Middle East respiratory syndrome coronavirus (MERS-CoV) infection: updates and implications for practice. *Journal of International Medical Research*, 48(1), pp. 1-6, 2019.
- [8] Alsubaie, S., Temsah, M. H., Al-Eyadhy, A. A., Gossady, I., Hasan, G. M., Al-rabiaah, A., ... & Somily, A. M.: Middle East Respiratory Syndrome Coronavirus epidemic impact on healthcare workers’ risk perceptions, work and personal lives. *The Journal of Infection in Developing Countries*, 13(10), pp. 920-926, 2019.
- [9] Asaad, A. M., El-Sokary, R. H., Alzamanan, M. A., & El-Shafei, M.: Knowledge and attitudes towards Middle East respiratory syndrome-coronavirus (MERS-CoV) among health care workers in south-western Saudi Arabia. *East Mediterr Health J*, 25, 2019.
- [10] Merchant, R. M.: Evaluating the Potential Role of Social Media in Preventive Health Care. *JAMA*, (2020), <https://jamanetwork.com/> on 01/10/2020.
- [11] Aiello, A. E., Renson, A., & Zivich, P. N.: Social Media—and Internet-Based Disease Surveillance for Public Health. *Annual Review of Public Health*, 41, pp. 23.1–23.18, 2020.
- [12] Choi, J., Cho, Y., Shim, E., & Woo, H.: Web-based infectious disease surveillance systems and public health perspectives: a systematic review. *BMC public health*, 16(1), pp. 1238, 2016.
- [13] Sharma, M., Yadav, K., Yadav, N., & Ferdinand, K. C.: Zika virus pandemic—analysis of Facebook as a social media health information platform. *American journal of infection control*, 45(3), pp. 301-302 2017.
- [14] Boit, J., & El-Gayar, O.: Topical Mining of Malaria Using Social Media. A Text Mining Approach. In: *Proceedings of the 53rd Hawaii International Conference on System Sciences*, University of Hawaii at Manoa, Hawaii, pp. 3811-3820, 2020.
- [15] Kilgo, D. K., Yoo, J., & Johnson, T. J.: Spreading Ebola panic: Newspaper and social media coverage of the 2014 Ebola health crisis. *Health communication*, 34(8), pp. 811-817, 2019.