Elsevier has created a Monkeypox Information Center in response to the declared public health emergency of international concern, with free information in English on the monkeypox virus. The Monkeypox Information Center is hosted on Elsevier Connect, the company's public news and information website.

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What concerns the general public the most about monkeypox virus? – A text analytics study based on Natural Language Processing (NLP)

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Dear editor,

At the time of writing this article (June 27, 2022), more than 50 countries have identified cases of monkeypox in their country, and the total number of monkeypox cases around the globe reached more than three thousand [1]. The world is yet to fully recover from the COVID-19 crisis, but the rise in the cases of monkeypox virus infection, especially in the areas outside of Africa, is a genuine concern that needs to be addressed [2].

Despite World Health Organization (WHO) have not yet recognized monkeypox as a pandemic, some experts consider it should be declared [3]. Ever since the recent COVID-19 outbreak, Twitter has become a platform for people across various walks of life to share their opinion regarding the health crisis. Many studies used Twitter as a data source to understand the recent COVID-19 crisis [4]. Understanding the general public's perspective on the health crisis is essential for government officials and policymakers as understanding the citizen's attitude towards the health crisis help them in devising health policies to monitor and control the crisis. In our study, we use advanced machine learning techniques, particularly that of Natural Language Processing (NLP) techniques, to understand the attitude of the common public towards the monkeypox virus.

For this study, using the Python library Twint, we have collected all the tweets posted on Twitter between (June 1, 2022 to June 25, 2022) that has the word monkeypox. After excluding all the tweets of other languages, we used 556,402 English tweets about the monkeypox for this study. This study was done in two parts. In part 1, we have used sentiment analysis to understand the perception of common people towards the monkeypox virus. Sentiment analysis is the process by which we determine the sentiment being expressed by an author in the text about a subject. We used Python Library TextBlob for the sentiment analysis study. "Textblob uses the Natural Language Processing and advanced Machine learning principles in analyzing every word in a statement, comment, and the tweet in the corpus and produces whether the overall sentiment of the particular document in the corpus is positive, negative, or neutral." [5].

In part 2, we used Latent Dirichlet Allocation (LDA) topic modeling to understand the significant aspects ordinary people discuss about the monkeypox virus while posting their opinions about it online. "A group of algorithms that summarizes a vast archive of texts by discovering the hidden topics and themes discussed within a set of corpora on its own is Topic Modeling" [6]. LDA follows the Bayesian principle where the algorithm assumes that all the documents in the corpus are a mixture of latent topics in which a topic is a topic is a multinomial distribution of words.

We used a total of 556,402 English tweets for our sentiment analysis study. Our sentiment analysis study reveals that out of 556,402 tweets, nearly half of the tweets (n = 267,974 (48.16%) about monkeypox have neutral sentiments. 160,391 tweets (28.82%) have a positive sentiment, and 128,037 (23.01%) have a negative sentiment. In part 2, we have performed the topic modeling to the tweets to understand the significant aspects ordinary people share in their social media posts while posting about the monkeypox virus. We have used only the social media posts about monkeypox having negative sentiments for the topic modeling study to understand the general public's concerns regarding the virus. The results of the topic modeling are given in Table 1.

Our sentiment analysis results have shown an interesting aspect that the ratio of people posting positively about the monkeypox virus on social media is higher (28.82%) than that of the ratio of people positing negatively about the monkeypox virus (23.01%). A closer analysis of the tweets shows that most tweets about monkeypox having positive sentiments talk about the non-severity of the virus and the lower death rate. Our sentiment results have shown that the general public hasn't yet panicked to much extent about the monkeypox virus. Our topic modeling results have shown that, among the tweets about monkeypox having negative sentiments, ordinary people were discussing about the deaths that the monkeypox virus can cause, the severity of the virus,

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Table 1
Topic modeling.

Topic label	Topic words
Death	Death, flu, due, number, cdc, fear
The severity of the virus	Protect, wonder, help, could, severe, monkeypox
Location	Case, Europe, Canada, monkeypox, report, Chicago
Whether the monkeypox virus is airborne	Disease, airborne, sexual, travel, symptom, rash
The lesion caused by the monkeypox	Monkeypox, rash, disgust, pore, lesion, bad
Vaccines for Monkeypox	Research, develop, vaccine, treatment, pox, inform
Monkeypox being the next pandemic	Monkeypox, pandemic, warn, next, world, outbreak
Traveling	Travel, mask, safe, transmission, infect, look, close
School	Kid, education, leave school, close, affect
Livelihood	Virus, destroy, stress, via, country, livelihood

(Note: Topic labels and topic names were manually named. Top words were generated by LDA model).

lesions caused by the monkeypox, whether the monkeypox virus is airborne, vaccines for the monkeypox virus, whether the monkeypox is the next pandemic after COVID-19, whether it is safe to travel, whether the virus spread will affect the functioning of the schools and whether the virus will affect the overall livelihood. Since we are in the very early stages of the crisis, our study will help both the researchers and the policymakers understand the issues that concern the public about the monkeypox virus so that effective awareness programs to address the concerns of the general public can be devised and the crisis can be controlled.

CRediT authorship contribution statement

Praveen Sv: Writing – review & editing, Programming Python crawler, coding, performing data analytics, Results analysis, writing. **Rajesh Ittamalla:** Conceptualization, Writing – review & editing, writing.

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