Original research article

UDK 616.98:578.834 (595)
616.98:578.834(594)
https://doi.org/10.46784/e-avm.v17i2.384

THE IMPACT OF COVID-19 ON HUMAN-PET RELATIONSHIPS IN MALAYSIA AND INDONESIA: A PUBLIC SENTIMENT ANALYSIS

Nazhan Ilias[1], Fathrurahiman Saidin[1], Nur Indah Ahmad[2], Moniza Waheed[3], Murni Wan Mohd Nor[4], Mokrish Ajat[1,5*]

[1] Universiti Putra Malaysia, Faculty of Veterinary Medicine, Department of Veterinary Preclinical Sciences, Serdang, Selangor, Malaysia
[2] Universiti Putra Malaysia, Faculty of Veterinary Medicine, Department of Veterinary Pathology and Microbiology, Serdang, Selangor, Malaysia
[3] Universiti Putra Malaysia, Faculty of Modern Languages and Communication, Department of Communication, Serdang, Selangor, Malaysia
[4] Universiti Putra Malaysia, Faculty of Human Ecology, Department of Government and Civilization Studies, Serdang, Selangor, Malaysia
[5] Universiti Putra Malaysia, Institute of Bioscience, Natural Medicines and Products Research Laboratory (NaturMeds), Serdang, Selangor, Malaysia

Abstract

Human stress levels escalated amid the COVID-19 epidemic as a result of restrictions on social interactions and movement. Furthermore, due to the lack of awareness about the disease's characteristics, numerous cases of violations of animal welfare occurred. The study is focused on the macro-level analysis regarding the impact of COVID-19 on human-pet interactions in Malaysia and Indonesia. A total of 1,829 tweets related to human-pet interactions during COVID-19 were retrieved from Twitter between March 17th and September 17th, 2020. Natural Language Toolkit (NLTK) was utilized to analyze the tweets with human moderation. The analysis revealed a large number of neutral and positive sentiments in the initial stage of the study. Later, positive public sentiment (50%, n = 27/54) rose in Malaysia significantly as the Twitter users were demanding justice for the abused animals. Meanwhile, the sentiments in Indonesia were pre-

[1*] Corresponding author: mokrish@upm.edu.my

dominantly both neutral (42%, n = 52/123) and positive (34%, n = 42/123), with the sentiment shifting after an incidence of animal cruelty went viral. Following a study in the United Kingdom reporting positive COVID-19 cases in cats, an upward trend in negative public reaction was observed in Malaysia (35%, n = 7/20) and Indonesia (48.8%, n = 40/82). In conclusion, the public sentiment regarding the impact of COVID-19 on human-pet interactions affects individuals due to the associated health risks.

Key words: COVID-19, Twitter users, pet owners, sentiment analysis, Malaysia, Indonesia, animal welfare, pandemic effects

UTICAJ COVID-19 NA ODNOSE IZMEĐU LJUDI I KUĆNIH LJUBIMACA U MALEZIJI I INDONEZIJI: ANALIZA JAVNOG MNJENJA

Nazhan Ilias[1], Fathrurahiman Saidin[1], Nur Indah Ahmad[2], Moniza Waheed[3], Murni Wan Mohd Nor[4], Mokrish Ajat[1,5]

[1] Univerzitet Putra Malezija, Fakultet veterinarske medicine, Katedra za predkliničku veterinarsku medicinu, Serdang, Selangor, Malezija
[2] Univerzitet Putra Malezija, Fakultet veterinarske medicine, Katedra za veterinarsku patologiju i mikrobiologiju, Serdang, Selangor, Malezija
[3] Univerzitet Putra Malezija, Fakultet modernih jezika i komunikacije, Katedra za komunikacije, Serdang, Selangor, Malezija
[4] Univerzitet Putra Malezija, Fakultet humane ekologije, Katedra za vladine i civilizacijske studije, Serdang, Selangor, Malezija
[5] Univerzitet Putra Malezija, Institut za biološke nauke, Laboratorija za istraživanje prirodnih lekova i proizvoda (NaturMeds), Serdang, Selangor, Malezija

Kratak sadržaj

Stres kod ljudi eskalirao je tokom pandemije COVID-19 kao posledica ograničenja društvenih interakcija i slobode kretanja. Usled nedovoljne informisanosti o karakteristikama bolesti, došlo je do brojnih slučajeva narušavanja dobrobiti životinja. Ovaj rad analizira na makro nivou uticaj COVID-19 na interakcije između ljudi i kućnih ljubimaca u Maleziji i Indoneziji. Ukupno 1.829 tvitova vezanih za interakcije ljudi i kućnih ljubimaca tokom pandemije COVID-19 preuzeto je sa Tvitera u periodu

od 17. marta do 17. septembra 2020. godine. Korišćeni su alati za obradu prirodnog jezika (NLTK) kako bi se izvršila analiza tvitova, uz moderiranje sadržaja vezanog za ljude. Analiza je otkrila veliki broj neutralnih i pozitivnih sentimenata prema životinjama u početnoj fazi studije. Kasnije je pozitivno raspoloženje javnosti (50%, n = 27/54) značajno poraslo u Maleziji, jer su korisnici Tvitera tražili pravdu za zlostavljane životinje. U međuvremenu, sentiment prema ljubimcima u Indoneziji bio je pretežno neutralan (42%, n = 52/123) i pozitivan (34%, n = 42/123), a do promena je došlo je nakon što je okrutnost prema životinjama eskalirala. Nakon studije iz Ujedinjenog Kraljevstva u kojoj su navedeni pozitivni slučajevi COVID-19 kod mačaka, u Maleziji (35%, n = 7/20) i Indoneziji (48,8%, n = 40/82) uočen je trend porasta negativnih reakcija javnosti. Odnos javnog mnjenja prema uticaju COVID-19 na odnos između ljudi i ljubimaca utiče na pojedince zbog rizika koji nosi po zdravlje ljudi.

Ključne reči: COVID-19, korisnici Twitter-a, vlasnici kućnih ljubimaca, analiza javnog mnjenja, Malezija, Indonezija, dobrobit životinja, uticaji pandemije

INTRODUCTION

The COVID-19 pandemic has caused unprecedented changes to human society, affecting various aspects of our lives, including interactions with animals. The imposed movement restrictions and social distancing measures have led to increased stress and anxiety among individuals, prompting many to seek solace in the companionship of pets (Martin et al., 2021). However, the pandemic has also been accompanied by concerning reports of animal abuse and abandonment (Carroll et al., 2022), raising questions about the impact of public sentiments on human-animal interactions during this challenging period. Early in the pandemic, concerns arose regarding the potential for SARS-CoV-2 transmission from humans and pets. Researchers initiated investigations to determine if pets, particularly dogs and cats, could serve as reservoirs or vectors for the virus (Hobbs and Reid, 2021). Several studies have reported instances of pets testing positive for SARS-CoV-2, primarily after close contact with COVID-19-positive owners (Sit et al., 2020; Garigliany et al., 2020; Newman et al., 2020; Barrs et al., 2020). Cats appear to be more susceptible than dogs, with some ferrets and other domesticated animals also showing susceptibility (Meisner et al., 2022). These cases sparked interest in understanding the

dynamics of human-to-animal transmission. While the primary concern was initially focused on human-to-pet transmission, research has also explored the possibility of reverse zoonotic transmission, where infected pets might transmit the virus back to humans (Meisner et al., 2022).

During crises, timely and accurate information is crucial. Sentiment analysis aids in crisis communication by assessing public reactions, identifying misinformation, and evaluating the effectiveness of emergency response efforts (Aldosery et al., 2024). This is particularly evident in natural disasters, public health emergencies, and other crises (Li et al., 2020). As the use of public sentiment in scientific research grows, literature also addresses ethical considerations and challenges (Hung et al., 2020). Issues related to privacy, bias in sentiment analysis algorithms, and the responsible use of data have emerged as critical issues for researchers and policymakers (Ligthart et al., 2021). Twitter datasets are a valuable data resource for investigating various research problems to enhance knowledge, innovation, and discovery in various sectors (Thakur, 2022). Studying the pattern of tweets may enable researchers to analyze the severity of public emotion towards the pandemic and its effect on humans and pets.

Social media, especially Twitter, has emerged as a powerful platform for sharing opinions, with its open text-sharing format providing valuable insight into public sentiment worldwide (Aldosery et al., 2024). Public sentiments, expressed through various channels such as social media, have become a valuable resource for scientific inquiry. In the context of public health, monitoring public sentiments on social media has proven to be a valuable tool for early disease surveillance and outbreak detection (Cui et al., 2023). Research has demonstrated the feasibility of using sentiment analysis to identify trends, detect emerging health concerns, and track the spread of diseases, including infectious diseases like flu and COVID-19 (Tan et al., 2021). Researchers investigating social issues and public opinion turn to sentiment analysis to evaluate societal attitudes. This demonstrates how sentiments expressed on social media platforms reflect public opinions on diverse topics, including social justice, equality, and human rights (Drus and Khalid, 2019).

Early coordinated responses to the pandemic are often linked to general positivity expressed in public sentiments (Lwin et al., 2022). However, negative sentiments have appeared as the public's frustration grows, with the pandemic affecting their health mental physical health. As the lockdown and restriction continued, certain countries experienced superstition, fatalism or anxiety, while others showed more positive reaction. The majority of the citizens accepted the restrictive measures, trusting the authorities' health measure and

availability of adequate public information (Lim et al., 2021). In this study, a macro-level analysis of public sentiment around COVID-19 is conducted and how these collective attitudes have impacted human-pet relationships in Malaysia and Indonesia is examined. Utilizing Twitter as the primary data source, this research investigates trends in public discourse related to pets during the pandemic, exploring how shared experiences and concerns influence pet ownership, care practices, and emotional reliance on pets. The analysis highlights the changing role of pets in offering companionship and support during times of crisis, influenced by the regional cultural and social contexts of these two countries.

MATERIALS AND METHODS

Authentication

Twitter developer account authentication is a process that allows developers to access Twitter's API on behalf of users. A Twitter developer account was obtained as required for this study. This process grants three main components: the bearer token, the access token, and the access token secret. To authenticate a request to the Twitter API, these tokens were included. The use of these tokens is essential for authentication in Python, enabling the data mining of tweets. (see Appendix A).

Installation of tools

PyCharm Community Edition was installed with the goal of providing the Python coding notebook. Several tools were installed in the notebook terminal, such as *ConfigParser, Tweepy, Pandas,* and *NLTK*. The installation required codes in the terminal (see Appendix B). *Configparser was* installed in order to allow the authentication tokens to be read in the codes*; Tweepy was* used for tweet search and collection; *Pandas* enabled the tweets mined by *Tweepy* to be read and saved; and the tweets were analysed by *NLTK*.

Data mining using Twitter API

The tweets were mined using *Tweepy* with authentication tokens obtained using Python codes (see Appendix C). To specify the tweets for this study, the keywords for query input are needed. In this study, the search term "cat OR dog OR pet from Malaysia (Wuhan virus OR corona OR COVID-19 OR

COVID OR lockdown OR MCO) since:2020-03-17 until:2020-09-17" was inputted in the queries. The words that were located outside of the bracket indicated the main keyword to be searched for; in this case, "cat," "dog," and "pet." The location of either Malaysia or Indonesia was inputted by "from:" and the country of the subject. The words in parentheses indicated as the word to search matches with the main keyword and time duration of the search were enclosed by the inputted "since" and "until." For the purpose of this study, the analysis comprised a total of 1,829 country-identifiable tweets from Malaysia (636) and Indonesia (1193).

Analysis of public sentiment

The data was then analyzed using the sentiment analyzer in the *NLTK (s*ee Appendix D*).* The tweets were systematically classified on a 1 to 5 scale to assess the public sentiment regarding the impact of COVID-19 on human-pet interactions. This scale was designed to capture a range of emotional responses expressed by the public during the pandemic. A score of 1 was assigned to tweets that conveyed a very negative sentiment, reflecting strong disapproval or concern about the effects of COVID-19 on human-pet relationships. A score of 2 indicated a negative sentiment, where the tone was generally unfavorable, expressing dissatisfaction or anxiety about the situation. Tweets with a score of 3 were classified as neutral, reflecting an absence of strong emotional reaction, indicating that the content did not exhibit a clear positive or negative stance on the issue. A score of 4 represented positive sentiment, with tweets expressing a generally favorable view of how COVID-19 influenced human-pet interactions, perhaps highlighting positive outcomes or coping mechanisms. Finally, tweets receiving a score of 5 were deemed very positive, reflecting enthusiasm, appreciation, or optimism regarding the bond between humans and pets amidst the challenges posed by the pandemic. This classification provided a comprehensive means to evaluate the public's emotional response to the evolving dynamics between humans and pets during the COVID-19 pandemic. To generate an accurate hybrid public sentiment approach, human moderation was implemented along with the analysis. In human moderation, each one of the tweets was read and re-rated to avoid being mistakenly classified. The examples of tweets that were data-mined from Malaysia (Table 1) and Indonesia (Table 2) were rated 1 to 5 based on the public sentiments.

Table 1. Examples of public sentiments tweets rated in Malaysia

Rating	Public Sentiments	Examples
1	Very Negative	**Original:** Bodoh ye kucing ni kenapa tak kene corona ek **Translation:** This cat is stupid, why doesn't it have covid?
2	Negative	**Original:** *Boleh sangat nak bela ambil kucing tepi jalan.... Tapi risau takut ada corona hmmm* **Translation:** You can really adopt the street cat… But I'm worried about covid hmmm
3	Neutral	**Original:** *@detikcom Ini bukan hal baru. memang ada corona virus pada kucing.* **Translation:** @detikcom This is nothing new. There is indeed a corona virus in cats.
4	Positive	**Original:** *Ketika negara mu lockdown tapi kucing adalah yang utama* **Translation:** When your country is in lockdown, but cats are the main thing
5	Very Positive	**Original:** *Pujuk hatiii .. hg bnyk kongsi dgn kucing hg ... Tu yg rezeki mai semulaaaa ... Macehhh kucing² kakak .. maceh sbb teman time mco Tq moni sushi batik n moty .. i gonna miss u play around ..* **Translation:** Persuading my heart ... you have shared a lot with your cats … They were the one that provided sustenance … Thank you my cats .. Thanks for accompanying me during MCO Thank you Moni, Sushi, Batik, and Monty .. I'm going to miss you playing around ..

Table 2. Examples of public sentiments tweets rated in Indonesia

Rating	Public Sentiments	Examples
1	Very Negative	**Original:** *@kumparan Besok minta Kementan mbuka peternakan kucing hitam. Tuh Vietnam sukses menekan corona* **Translation:** kumparan Tomorrow ask the Ministry of Agriculture to open a black cat 'farm'. Vietnam has succeeded in suppressing covid.
2	Negative	**Original:** *@thisiscakelat Nongki terus, g takut corona kucing muu* **Translation:** @thisiscakelat Keep hanging out, don't be afraid of covid your cat
3	Neutral	**Original:** *Si Moren, kucing di rumah udah mulai bersin-bersin, flu mungkin. Ini kucing ga bisa jadi carrier COVID-19 kan? Anybody?* **Translation:** Moren, the cat at home has started sneezing, maybe it's a cold. This cat can't be a carrier of COVID-19, right? Anyone?
4	Positive	**Original:** *Mantan model di Gowa, Sulawesi Selatan, selamatkan puluhan kucing yang telantar di saat pandemi COVID-19. #IndosiarBerita Baiknya…* **Translation:** A former model in Gowa, South Sulawesi, rescued dozens of abandoned cats during the COVID-19 pandemic. #IndosiarBerita Kind…
5	Very Positive	**Original:** *Puasa kali ini bener-bener beda kondisinya, tapi situasinya tetep sama aja sendiri dirumah ditemani kucing kesayangan 😁 Alhamdulillah atas segala rezeki yg dikasih Allah SWT #corona #COVID-19* **Translation:** The conditions of fasting this time are really different, but the situation is still the same, alone at home accompanied by your beloved cat 😁 Thank God for all the good fortune given by Allah SWT #corona #COVID-19

Relation of public sentiment to events

Events were identified through mentions in tweets and subsequently analyzed for their impact on changes in public sentiment. Briefly, events were identified by scanning the collected tweets for mentions of specific keywords, phrases, or hashtags related to significant occurrences during the study period. These events could include government action, animal welfare, research on COVID-19 regarding pets, or any other significant events that could potentially affect public perception. Tweets over time related to each event were analyzed to identify associations and changes in public sentiment.

RESULTS

The following section provides a detailed analysis of the volume of tweets, public sentiment scores, and the qualitative labels assigned to sentiments by each country, alongside key global and local responses. In general, positive and neutral sentiments were the most prevalent among Malaysian and Indonesian Twitter users, respectively, particularly at the outset of the study. However, a noticeable shift in public sentiment occurred in both countries over the course of the study, reflecting the evolving circumstances. This change in sentiment was influenced by various events during the study period, which were closely tied to the progression of the pandemic. The trend of positive COVID-19 cases in both Malaysia and Indonesia, as depicted in Figure 1, provides a contextual backdrop for these shifts in public sentiment.

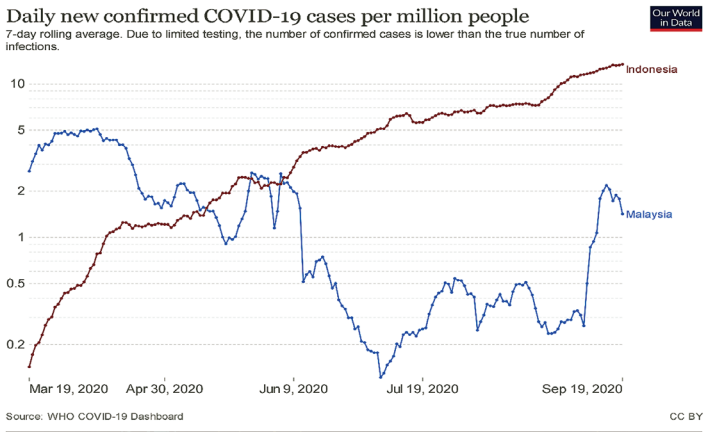

Figure 1. Logged number of positive COVID-19 in Malaysia and Indonesia from 17th March 2020 to 17th September 2020. Adapted from Our World in Data, by University of Oxford, n.d.: https://ourworldindata.org/coronavirus/country/malaysia?country=MYS~IDN)

The initial response (March 18, 2020)

At the outset of this study, on March 18th, 2020, coinciding with the initial stages of the COVID-19 pandemic (Figure 2), the public sentiment expressed by Malaysian Twitter users was largely neutral. Namely, 31.1% (n = 14/45) of the tweets reflected neutral sentiment. Meanwhile, both positive and very positive sentiments were recorded at 26.7% (n = 12/45), indicating a moderate level of optimism. In contrast, negative sentiment was relatively less pronounced, with 13.3% (n = 6/45) of tweets expressing dissatisfaction, while only 2.2% (n = 1/45) conveyed very negative sentiments.

Similarly, on March 18th, 2020, as shown in Figure 3, the sentiment among Indonesian Twitter users at the pandemic's onset was marked by a dominant positive response, with 47.8% (n = 11/23) of tweets reflecting positive emotions. Additionally, 26.1% (n = 6/23) of the tweets were classified as either neutral or very positive, further emphasizing a generally favourable perspective.

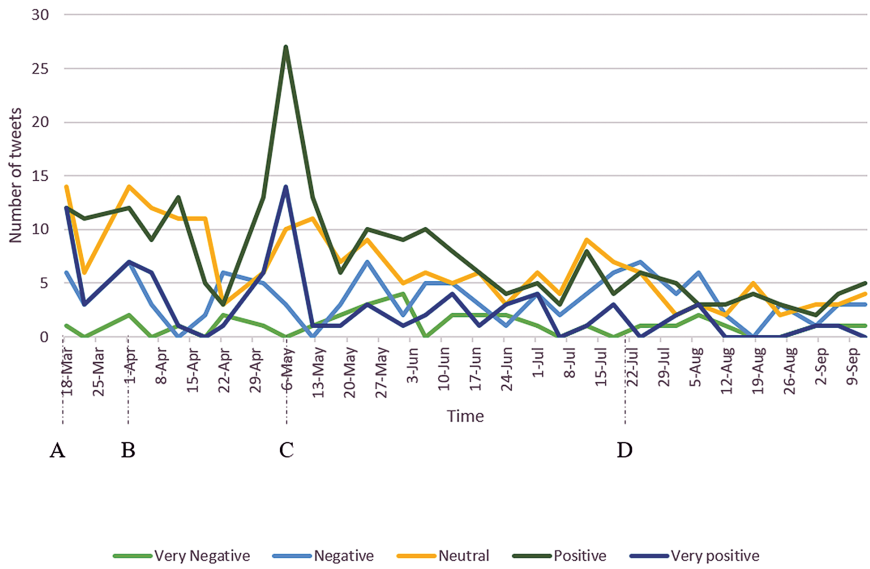

Figure 2. Public sentiments about COVID-19 Influencing the Interaction Between Pets and Human in Malaysia. (A) Movement control order (MCO) commenced, (B) second week of MCO (first extension of MCO), (C) outcry against animal cruelty, and (D) News report of COVID-19 positive in cats in United Kingdom

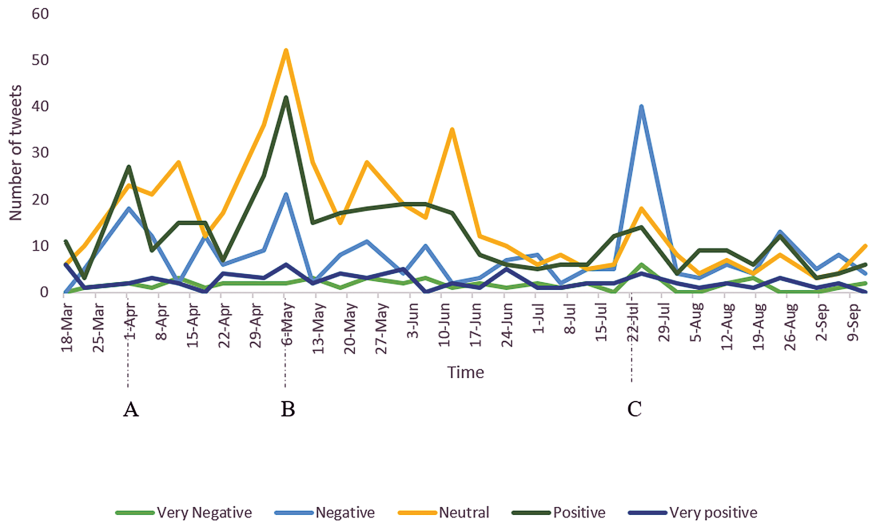

Figure 3. Public sentiments of COVID-19 in Influencing the Interaction Between Pets and Human in Indonesia. (A) Government refusal in movement restriction action, (B) outcry against animal cruelty, and (C) news report of COVID-19 positive in cats in United Kingdom

The Second Week of Movement Control Order (April 1st, 2020)

As the second week of the Movement Control Order (MCO) commenced, the public sentiment expressed by Malaysian Twitter users began to shift, with a very negative sentiment recorded at 4.8% (n = 2/42) and negative sentiment at 16.7% (n = 7/42). However, neutral and positive sentiments continued to dominate the discourse, accounting for 33.3% (n = 14/42) and 28.6% (n = 12/42) of the tweets, respectively, as depicted in Figure 2. Notably, the proportion of very positive sentiment declined to 16.7% (n = 7/42), which is a decrease when compared to the data collected on March 18th, 2020. In Indonesia, amidst growing public apprehension and the government's decision not to impose further movement restrictions, a noticeable shift in sentiment occurred. As shown in Figure 3, there was an increase in both very negative sentiment (2.8%, n = 2/72) and negative sentiment (25%, n = 18/72). The percentage of very positive sentiment remained low at 2.8% (n = 2/72), while positive (37.5%, n = 27/72) and neutral (31.9%, n = 23/72) sentiments continued to be predominant.

The Outcry Against Animal Cruelty (May 6th, 2020)

On May 6th, 2020, a widely publicized case of animal cruelty marked a pivotal moment in the public sentiment expressed by Malaysian Twitter users, as shown in Figure 2. In the wake of this incident, positive sentiment surged significantly, reaching 50% (n = 27/50) of the tweets. Conversely, no tweets reflected a very negative sentiment (n = 0), while negative sentiment accounted for only 6% (n = 3/50), and neutral sentiment was observed in 20% (n = 10/50). Very positive sentiment, which expressed strong approval, was recorded at 28% (n = 14/50). Similarly, this event had a profound effect on Indonesian Twitter users, as illustrated in Figure 3, where neutral and positive sentiments were predominant, comprising 42% (n = 52/123) and 34% (n = 42/123) of the tweets, respectively.

Concerns Over COVID-19 in Cats (July 22, 2020)

On July 22nd, 2020, public sentiment among Malaysian Twitter users underwent another significant shift, this time in response to reports of COVID-19 cases in cats in the United Kingdom. As illustrated in Figure 2, negative sentiment rose notably, reaching 35% (n = 7/20) of the tweets. Similarly, there was also a shift in sentiment among Indonesian Twitter users beginning on July 22nd, 2020, in reaction to the same news about COVID-19 in cats in the United Kingdom. As shown in Figure 3, a negative sentiment increased substantially, accounting for 48.8% (n = 40/82) of the tweets.

DISCUSSION

This study provides a comprehensive analysis of public sentiment on COVID-19 and examines its impact on human-pet relationships in Malaysia and Indonesia. Data was obtained and classified into 4 courses of events which are the following: 1) the initial response (March 18th, 2020), 2) the second week of MCO (April 1st, 2020), 3) the outcry against animal cruelty (May 5th, 2020), and 4) concerns over COVID-19 in cats (July 22nd, 2020). By leveraging Twitter as a key data source, this research looks into how pandemic-related discourse has shaped perceptions and interactions with pets in these regions. Findings reveal a range of public attitudes towards pets throughout the courses, highlighting how these relationships have been both challenged and deepened in response to the pandemic's stressors.

Overall, public sentiment toward pets has been dynamic, reflecting vary-

ing stress levels in Malaysia and Indonesia, where higher daily COVID-19 case counts appeared to correlate with heightened stress among citizens (Manchia et al., 2022). During the initial response on March 18th, 2020, it was observed that Malaysians who interacted with pets or stray animals displayed predominantly positive attitudes in managing the early stages of the COVID-19 situation. A high proportion of neutral sentiment may indicate early-stage adaptation and uncertainty (Yang et al., 2020). Similarly, further findings on Indonesian Twitter users particularly those engaged with pets or stray animals, exhibited a notably optimistic outlook in managing the early challenges of the COVID-19 pandemic. A significant proportion of positive sentiment may reflect a broader sense of confidence in their ability to navigate the crisis effectively, likely influenced by their close interactions with animals, which could have provided comfort and emotional stability during uncertain times. Throughout this period, many pet owners reported spending more time with their pets, which they recognized as beneficial for reducing stress and anxiety during the crisis (Ogata et al., 2023).

On the second week of MCO (April 1, 2020), increased concerns among Malaysian and Indonesian Twitter users regarding the potential transmission of SARS-CoV-2 between humans and pets, as well as the reverse transmission from pets to humans were observed. This outcome could potentially be the result of a surge of misinformation, conspiracy theories, and unverified claims about COVID-19. Such content, often including misleading narratives, significantly impacted public perceptions, heightening concerns about the virus (Hughes et al., 2022). Clearly, public sentiment regarding the potential transmission of COVID-19 from pets to humans has been mixed. Some individuals expressed concerns about the possibility of pets serving as reservoirs for the virus, while others emphasized the limited evidence of human-to-pet transmission (Agley and Xiao, 2021). Subsequent research has confirmed that SARS-CoV-2, the virus responsible for COVID-19, can be transmitted from humans to animals through close contact. Notably, domestic pets such as cats and dogs have contracted the virus, typically following direct exposure to infected individuals (Meisner et al., 2022). Although the likelihood of pets transmitting COVID-19 to humans is minimal, pets can occasionally experience severe illness due to the virus, although such cases remain extremely rare (Nielsen et al., 2023). This divergence in opinion underscores the need for continued research to clarify the complexities of disease transmission, particularly regarding cross-species interactions and the role of environmental factors. Furthermore, ongoing studies are essential to deepen our understanding of information control during the pandemic, particularly in relation to how

public perceptions have been shaped by the flow of information during this critical period. In response, the media played a crucial role in health communication, striving to keep the public well-informed and to foster a supportive and healthy environment (Mian and Khan, 2020).

Other important highlights that took place during COVID-19 pandemic were the outcry against animal cruelty on 6th May 2020 and the concerns over COVID-19 in cats on 22nd July 2020. This shift in sentiment reflected widespread concern regarding the potential health risks posed by the virus to both humans and their pets. The news sparked a sense of anxiety, as Malaysians and Indonesians feared the possibility of their pets becoming infected, which could potentially exacerbate the challenges they were already facing in managing the pandemic. According to research from Harvard, misinformation about zoonotic disease contributed greatly to these outcomes. Due to unclear information about how the virus could spread between humans and animals, many pet owners made hasty, and often unnecessary, choices concerning their pets' well-being (Harvard Law School, 2021). Additionally, when the virus was initially linked to a wet market, attention quickly turned to wildlife trade practices and market conditions worldwide. These markets, where animals are confined in close, often unsanitary conditions, have long been linked to zoonotic disease risks. Studies suggest that the pandemic amplified public demands for stricter regulations or even the closure of these wildlife markets, as concerns for both animal welfare and public health grew more urgent (Young, 2024). Besides, the urgent need for COVID-19 treatments and vaccines led to a significant increase in animal testing, which in turn raised ethical concerns about the welfare of animals involved in such rapid scientific efforts. This heightened focus has prompted researchers and advocates to call for alternatives to animal models, such as in vitro techniques and computational simulations, particularly for future studies where these alternatives may be feasible. These approaches are seen as essential to reduce reliance on animal testing while still achieving scientific progress (Harvard Law School, 2021). During this phase, there was widespread outrage and emotional response to the cruelty incident, signaling a collective demand for justice and reform in the treatment of animals. The significant presence of positive sentiment highlights the strong emotional bond between pet owners and animal advocates, as well as a powerful call for justice in response to acts of animal abuse. The incident acted as a catalyst, sparking a wave of empathy and advocacy for animal welfare, as users voiced their concerns and called for stronger protection of animals. This emotional outpouring reflects broader societal values regarding the ethical treatment of animals and the collective demand for accountability in cases of abuse.

CONCLUSION

The COVID-19 pandemic has undoubtedly impacted human-animal interactions, particularly in Malaysia and Indonesia. Our analysis of public sentiments surrounding the pandemic and its influence on human-pet interactions has revealed several key insights. In conclusion, the COVID-19 pandemic has highlighted the dynamic nature of public sentiment and its influence on human-pet interactions. While positive sentiment generally prevails, external factors such as viral events and perceived health risks can trigger shifts in perception. Addressing animal welfare issues during times of crisis requires a nuanced understanding of public sentiment, responsible media reporting, and clear communication from experts to safeguard the well-being of both humans and animals.

ACKNOWLEDGEMENTS

This study was conducted without external financial support. The authors would like to thank Nur Fitriah Saidin, Nik Amir Azib Abd Rahman and the Phyton coding community on Github for their outstanding guidance and knowledge contributed to this study. This research was conducted as part of the author's Doctor of Veterinary Medicine Final Year Project's thesis entitled "Assessment of Public Sentiments of Covid-19 in Influencing the Interaction Between Humans and Pets in Malaysia and Indonesia".

Author's Contribution

NIA, MW, MWMN and MA made contributions to conception and design of the study and revised the manuscript critically. FS involved in data collection and analysis, and drafting the manuscript. NI performed the statistical analysis, revised the manuscript critically and prepared the final draft of the manuscript. All authors read and approved of the final manuscript.

Competing interest

The authors declare that they have no conflicts of interest.

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Appendix A

```
import tweepy
# Set up your Twitter API credentials
consumer_key = 'YourConsumerKey'
```

```
consumer_secret = 'YourConsumerSecret'
access_token = 'YourAccessToken'
access_token_secret = 'YourAccessTokenSecret'
# Authenticate with Twitter API
auth = tweepy.OauthHandler (consumer_key, consumer_secret)
auth.set_access_token (access_token, access_token_secret)
```

Appendix B

```
#Installation of tools
PS C:\Users\user\PycharmProjects\pythonProject> pip install configparser
PS C:\Users\user\PycharmProjects\pythonProject> pip install tweepy
PS C:\Users\user\PycharmProjects\pythonProject> pip install pandas
PS C:\Users\user\PycharmProjects\pythonProject> pip install nltk
```

Appendix C

```
# Create the API object
import tweepy
# Set your Twitter API credentials
consumer_key = 'your_consumer_key'
consumer_secret = 'your_consumer_secret'
access_token = 'your_access_token'
access_token_secret = 'your_access_token_secret'
# Authenticate with Twitter API
auth = tweepy.OAuthHandler(consumer_key, consumer_secret)
auth.set_access_token(access_token, access_token_secret)
api = tweepy.API(auth)
# Define your search query
query = " cat OR dog OR pet from:Malaysia (wuhan virus OR corona OR COVID-19 OR covid OR lockdown OR MCO) since:2020-03-17 until:2020-09-17"
# Search for tweets
tweets = tweepy.Cursor(api.search, q=query, lang="msa").items()
# Iterate through the results and print tweets
for tweet in tweets:print(tweet.text)
```

Appendix D

```
# Import library
import pandas as pd
from nltk.sentiment import SentimentIntensityAnalyzer
# Change csv to data frame
df = pd.read_csv('your_file.csv')
# Analyse data frame and create new column in csv
from nltk.sentiment import SentimentIntensityAnalyzer
sia = SentimentIntensityAnalyzer()
df['Sentiment'] = df['Text_Column'].apply(lambda x: sia.polarity_
scores(x)['compound'])
# Saving the files
df.to_csv('sentiment_results.csv', index=False)
```

Received: 19.06.2024.
Accepted: 15.12.2024.