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Digital Disaster Communication in Gaya: Twitter's Role in Navigating Heat Wave Emergencies

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Abstract

With the intensification of climate-induced disasters, particularly heat waves in regions like Gaya, Bihar, there is a growing need to understand the role of digital platforms in disaster communication. This study explores how Twitter functions as a tool for navigating heat wave emergencies by analyzing responses from 188 Twitter users in Gaya. The research investigates user behavior, types of information sought, perceived reliability, and the extent to which Twitter contributes to preparedness. Findings reveal that a significant portion of users actively engage with Twitter during heat waves, primarily for weather alerts, health tips, and government advisories. While many users find the platform reliable and helpful for real-time preparedness, challenges such as misinformation, lack of localized content, and digital accessibility remain key concerns. The study contributes to the discourse on ICT-based disaster communication and suggests practical strategies for improving digital disaster literacy and engagement in climate-vulnerable regions.

Keywords: Climate Change, Digital Communication, Disaster Preparedness, Heat Wave, Twitter

Introduction

Climate change has increasingly manifested in the form of extreme weather events, and among them, heat waves have become a growing public health concern, particularly in India (Bush et al., 2011) (De Bont et al., 2024) (Majra & Gur, 2009) (N et al., 2023). States like Bihar, and districts such as Gaya, are now facing prolonged periods of dangerously high temperatures, often leading to increased mortality, reduced productivity, infrastructure stress, and severe public health challenges. As heat waves intensify both in frequency and duration, the need for timely, accurate, and accessible communication becomes crucial for effective disaster risk reduction and community preparedness (Shi et al., 2020) (Spears, 2015) (Béné et al., 2017).

While conventional communication systems (such as television, radio, and public announcements) continue to play a role in disaster communication (Kumar et al., 2023), they often suffer from delays, lack of interactivity, and limited reach in real-time emergency contexts. In contrast, the rapid rise of digital technology, especially mobile internet and social media platforms, offers new possibilities for timely and participatory disaster communication (Baraldo & Di Giuseppantonio Di Franco, 2024) (Simon et al., 2015). Twitter, in particular, stands out due to its real-time information-sharing capabilities, open network structure, and potential for direct engagement between citizens, media, and authorities (Bonsón et al., 2019) (Housley et al., 2018) (Blasi et al., 2022). With increasing smartphone usage even in rural and semi-urban areas of India, platforms like Twitter are beginning to play a critical role not just in

entertainment and opinion-building but also in crisis response. Twitter enables users to access updates, share experiences, alert others, and even seek help during emergencies (Gnanasambandam et al., 2012) (Chen & Wang, 2021) (Kaduskar et al., 2010). Despite this potential, little empirical research has been done to understand how Twitter functions as a disaster communication tool at the grassroots level, especially in smaller cities like Gaya. Moreover, it remains unclear how users perceive the reliability of such information, what challenges they face in digital engagement, and whether this form of communication leads to actual preparedness during events like heat waves(Cooper et al., 2015) (Qiang et al., 2012) (Vera-Burgos & Padgett, 2020) (Alves, n.d.) (*Chapter 14: International Cooperation*, n.d.).

This study, therefore, seeks to explore the role of Twitter in navigating heat wave emergencies in Gaya. It examines the behavior, preferences, and challenges faced by 188 Twitter users in accessing and disseminating heat wave-related information. The research aims to provide a nuanced understanding of how digital platforms contribute to disaster awareness and preparedness in vulnerable regions. By focusing on a Tier-2 Indian city, this study contributes to the growing body of literature on digital disaster communication and climate resilience. It offers practical insights for policymakers, disaster managers, and digital media strategists who are looking to harness social media as a tool for inclusive and effective risk communication. In doing so, it also highlights the urgent need to strengthen digital infrastructure, promote media literacy, and ensure the accessibility of credible and localized information during climate-induced emergencies.

Research Question:

How is Twitter used as a tool for digital disaster communication during heat wave emergencies in Gaya, and how effective is it in disseminating timely information and engaging the public?

Objectives:

1. To analyze the type and frequency of Twitter posts related to heat wave emergencies in Gaya.
2. To assess the effectiveness of Twitter in providing timely alerts, safety guidelines, and government advisories during heat wave situations.
3. To examine public engagement, response patterns, and the role of local influencers or authorities on Twitter during heat wave emergencies in Gaya.

Methodology

This study employs a descriptive cross-sectional research design to explore how Twitter users in Gaya perceive and utilize the platform for disaster communication during heat wave emergencies. The research collects primary data directly from Twitter users residing in Gaya through purposive sampling, targeting those who actively engage with heat wave-related content on Twitter. A structured online questionnaire consisting of close-ended questions is developed using tools such as Google Forms. This questionnaire focuses on users' frequency of Twitter use during heat waves, the types of information they seek or share (including alerts, government updates, and health tips), their perception of Twitter's usefulness and reliability in such situations, and their engagement behavior, such as liking, sharing, commenting, and tagging officials. The survey link is distributed via Twitter, WhatsApp groups, and direct

messages to reach the targeted respondents. Data collected from approximately 188 participants are analyzed using descriptive statistics such as frequency, percentage, and mean, with cross-tabulation applied to identify behavioral patterns across demographic variables like age, gender, and education. Microsoft Excel is used for efficient data processing and visualization. Ethical considerations are strictly followed throughout the study, ensuring voluntary participation, informed consent, and the anonymity and confidentiality of all respondents. The study adheres to established ethical standards for digital and social science research.

Findings & Discussion

Table 1: Age Group		
Response	**Frequency**	**Percentage**
18-25	85	45.21
26-35	60	31.91
36-45	30	15.96
46 and above	13	6.91

Table 1: **Age Group**

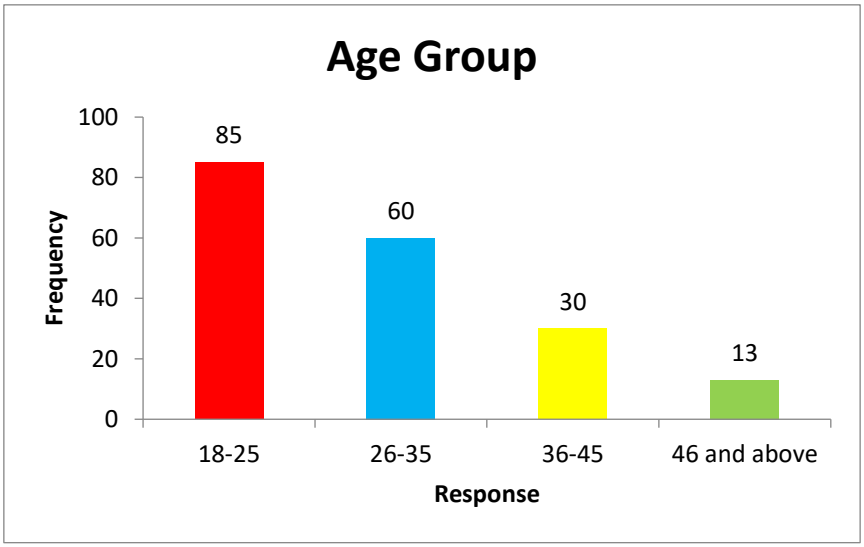

Figure 1: **Age Group**

Table 1: Age Group shows the distribution of respondents according to their age categories. Out of 188 participants, the highest number (85 respondents) belong to the 18–25 age group. This is followed by 60 respondents in the 26–35 category, 30 in the 36–45 group, and 13 respondents aged 46 and above. The data indicates that the majority of Twitter users engaging in disaster communication during heat wave events in Gaya are younger individuals, particularly those under the age of 35. This age group is often more digitally literate, technologically adaptive, and socially active on platforms like Twitter, which may explain their higher representation. The lower participation from older age groups suggests a possible digital

divide that may impact how effectively different age cohorts access and utilize Twitter for emergency communication. This variation in age distribution is crucial for designing inclusive and age-sensitive communication strategies during climate-related disasters.

Table 2: Gender		
Response	**Frequency**	**Percentage**
Male	105	55.85
Female	80	42.55
Prefer not to say	3	1.6

Table 2: **Gender**

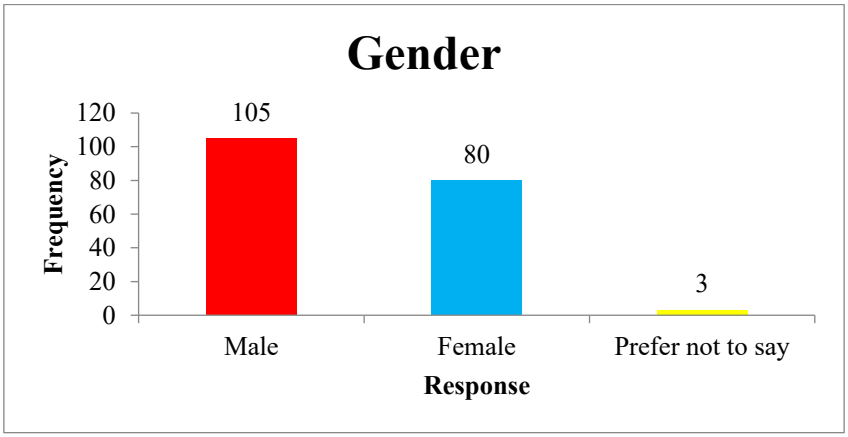

Figure 2: **Gender**

Table 2: Gender outlines the gender composition of the study's respondents. Of the 188 individuals surveyed, 105 identified as male and 80 as female. Additionally, 3 respondents chose not to disclose their gender. The relatively balanced representation of male and female participants provides a useful foundation for examining gender-based patterns in Twitter usage during heat wave emergencies. The high number of female participants highlights the growing engagement of women in digital spaces, including disaster-related discourse and information sharing. At the same time, the presence of individuals who preferred not to specify their gender, although minimal, raises important considerations about user privacy, self-identification, and inclusivity in digital research. Understanding these gendered dynamics is essential for tailoring disaster communication efforts that are equitable and responsive to the needs of all users.

Table 3: Education		
Response	**Frequency**	**Percentage**
High school or below	35	18.62
Undergraduate	95	50.53
Postgraduate	50	26.6

Other	8	4.26

Table 3: **Education**

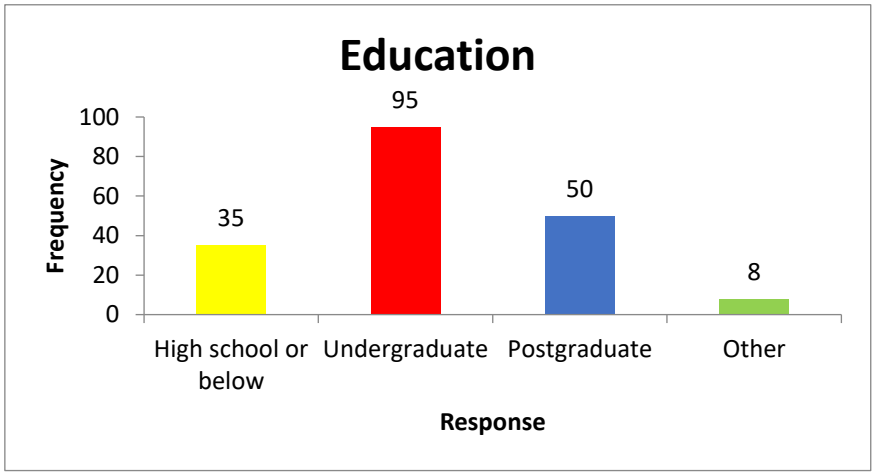

Figure 3: **Education**

Table 3: Education presents the distribution of respondents based on their educational attainment. Out of the total 188 participants, 95 individuals reported having an undergraduate degree, making it the most common educational qualification among the sample. This is followed by 50 respondents with postgraduate degrees, and 35 with a high school education or below. Additionally, 8 participants indicated 'Other' as their educational background, which may include vocational or non-formal education. The predominance of respondents with undergraduate and postgraduate qualifications suggests a sample with relatively high educational attainment. This is a critical factor in assessing the effectiveness of digital disaster communication via Twitter, as individuals with higher levels of education are generally more adept at accessing, interpreting, and disseminating information in digital environments. The inclusion of respondents from lower educational backgrounds, however, ensures that the study also captures the perspectives of those who may face greater barriers in utilizing such platforms effectively.

Table 4: Twitter Use Frequency		
Response	**Frequency**	**Percentage**
Multiple times a day	90	47.87
Once a day	55	29.26
A few times a week	30	15.96
Rarely	10	5.32
Never	3	1.6

Table 4: **Twitter Use Frequency**

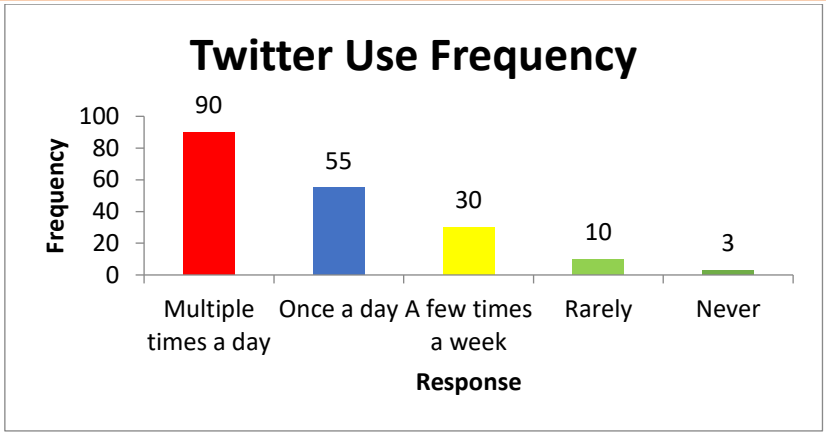

Figure 4: **Twitter Use Frequency**

Table 4: explores how frequently respondents use Twitter. Out of 188 participants, 90 individuals report using the platform multiple times a day, indicating high levels of engagement. An additional 55 participants use it once daily, and 30 access it a few times a week. Meanwhile, 10 respondents rarely use Twitter, and only 3 report never using it. These findings demonstrate a substantial level of daily and habitual engagement with Twitter, positioning it as a viable platform for rapid information dissemination during disasters such as heat waves. The frequent usage among the majority indicates that Twitter can be effectively integrated into localized early warning systems and preparedness campaigns.

Table 5: Twitter Use During Heat Wave

Response	**Frequency**	**Percentage**
Always	40	21.28
Often	70	37.23
Sometimes	50	26.6
Rarely	20	10.64
Never	8	4.26

Table 5: **Twitter Use During Heat Wave**

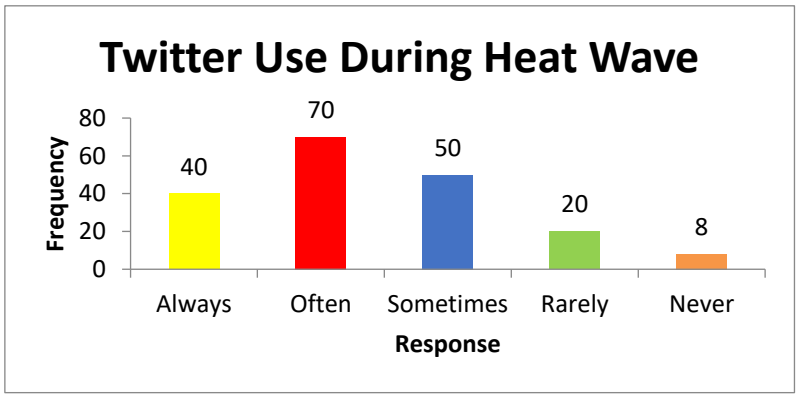

Figure 5: **Twitter Use During Heat Wave**

Table 5 details respondents' use of Twitter specifically during heat wave conditions. Among 188 respondents, 40 indicate that they always use Twitter in such situations, while 70 report using it often, and 50 use it sometimes. A smaller number, 20 respondents, rarely use Twitter during heat waves, and 8 never do. This data suggests that a significant portion of users turn to Twitter for information and updates during periods of extreme heat. It reinforces Twitter's potential as a supportive tool for situational awareness and public engagement during climate-related emergencies.

Table 6: Types of Info Sought

Response	**Frequency**	**Percentage**
Weather alerts/forecasts	150	23.92
Government advisories	140	22.33
Health and safety tips	130	20.73
Personal experiences	85	13.56
News updates from media	110	17.54
Other	12	1.91

Table 6: **Types of Info Sought**

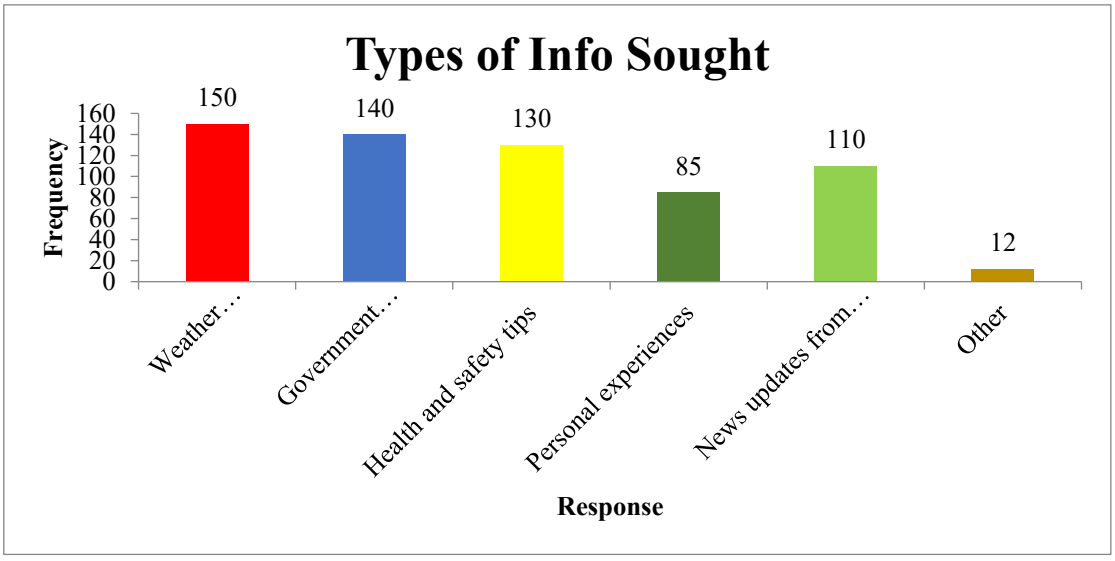

Figure 6: **Types of Info Sought**

Table 6: identifies the types of information users seek on Twitter during heat wave events. Out of 188 participants, 150 respondents reported searching for weather alerts and forecasts, 140 for government advisories, and 130 for health and safety tips. Other common searches include news updates from media (110 responses), personal experiences (85 responses), and a small number (12) under the 'Other' category. This diverse range of information needs shows that Twitter serves not just as a news platform but also as a personalized and real-time information source during climate emergencies. The prominence of institutional information like advisories and forecasts further underlines its role in risk communication.

Table 7: Perceived Reliability		
Response	**Frequency**	**Percentage**
Very reliable	50	26.6
Somewhat reliable	85	45.21
Neutral	30	15.96
Somewhat unreliable	18	9.57
Very unreliable	5	2.66

Table 7: **Perceived Reliability**

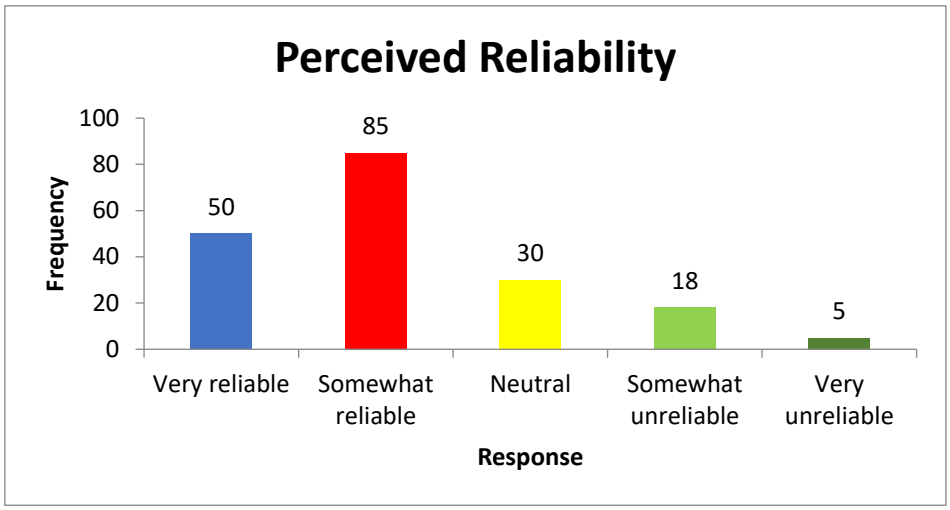

Figure 7: **Perceived Reliability**

Table 7: addresses respondents' perceptions of the reliability of Twitter as a source of information during heat wave events. Out of 188 participants, 50 consider Twitter to be very reliable, and 85 rate it as somewhat reliable. Thirty respondents view the platform with neutrality, while 18 consider it somewhat unreliable, and only 5 see it as very unreliable. These findings suggest a generally positive perception of Twitter's credibility among users, which is crucial for any platform aspiring to be an effective tool for disaster communication. However, the presence of skepticism among some users points to the ongoing challenge of combating misinformation and ensuring source credibility.

Table 8: Helps Prepare		
Response	**Frequency**	**Percentage**
Strongly agree	60	31.91
Agree	80	42.55
Neutral	30	15.96

Disagree	12	6.38
Strongly disagree	6	3.19

Table 8: **Helps Prepare**

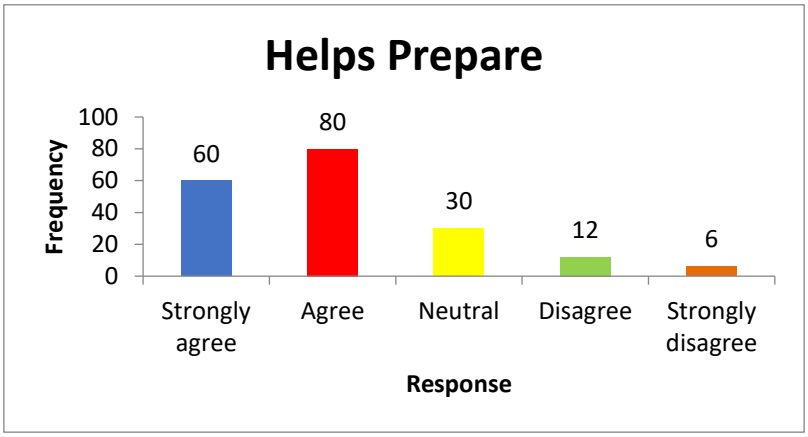

Figure 8: **Helps Prepare**

Table 8 examines whether users believe that information accessed via Twitter helps them prepare for heat wave emergencies. Of the total 188 participants, 60 strongly agree and 80 agree with this statement, reflecting a majority who perceive Twitter as a useful tool in preparedness efforts. Thirty respondents remain neutral, while 12 disagree and 6 strongly disagree. The high level of agreement underscores Twitter's potential as a valuable channel for enhancing individual and community preparedness. It also suggests that timely, accurate information on the platform can translate into informed actions, thereby supporting local climate resilience efforts.

Table 9: Engagement Frequency		
Response	**Frequency**	**Percentage**
Always	30	15.96
Often	60	31.91
Sometimes	50	26.6
Rarely	35	18.62
Never	13	6.91

Table 9: **Engagement Frequency**

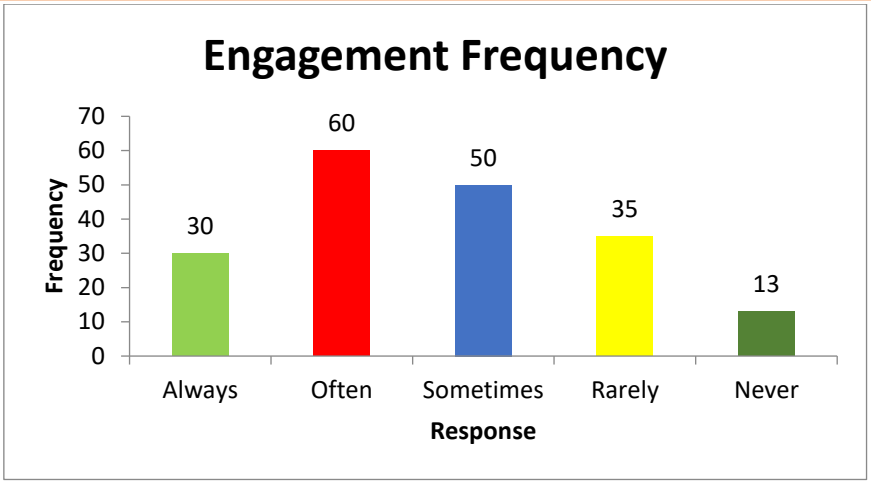

Figure 9: **Engagement Frequency**

Table 9: explores how frequently respondents engage with heat wave-related content on Twitter. Among the 188 participants, 30 report always engaging, 60 do so often, and 50 sometimes. Meanwhile, 35 respondents rarely engage, and 13 never engage with such content. This data indicates a moderately high level of public interaction with heat wave information on Twitter. The variation in engagement frequency highlights differences in digital behavior, suggesting that while a substantial number of users are proactive in responding to relevant content, others may require more targeted outreach or motivation to participate in disaster discourse online.

Table 10: Tagged Officials

Response	**Frequency**	**Percentage**
Yes	45	23.94
No	143	76.06

Table 10: **Tagged Officials**

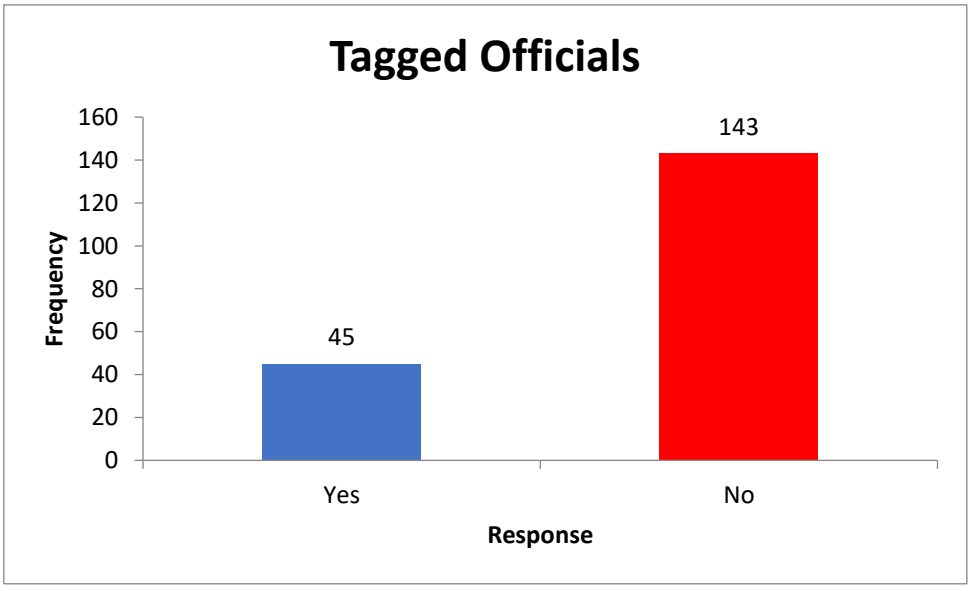

Figure 10 Tagged Officials

Table 10 addresses whether users tag government officials or authorities while discussing or sharing heat wave-related information on Twitter. Out of 188 respondents, only 45 indicated that they had tagged officials, while a significant majority of 143 said they had not. This suggests that while Twitter is used to consume and share information, direct interaction with policymakers or agencies remains limited. The relatively low level of tagging may indicate either a lack of awareness about the possibility of direct engagement or a lack of trust in institutional responsiveness. Enhancing digital civic engagement strategies could encourage more users to involve authorities in disaster communication on social media.

Table 11: Sharing Info

Response	**Frequency**	**Percentage**
Always	40	21.28
Often	70	37.23
Sometimes	45	23.94
Rarely	25	13.3
Never	8	4.26

Table 11 Sharing Info

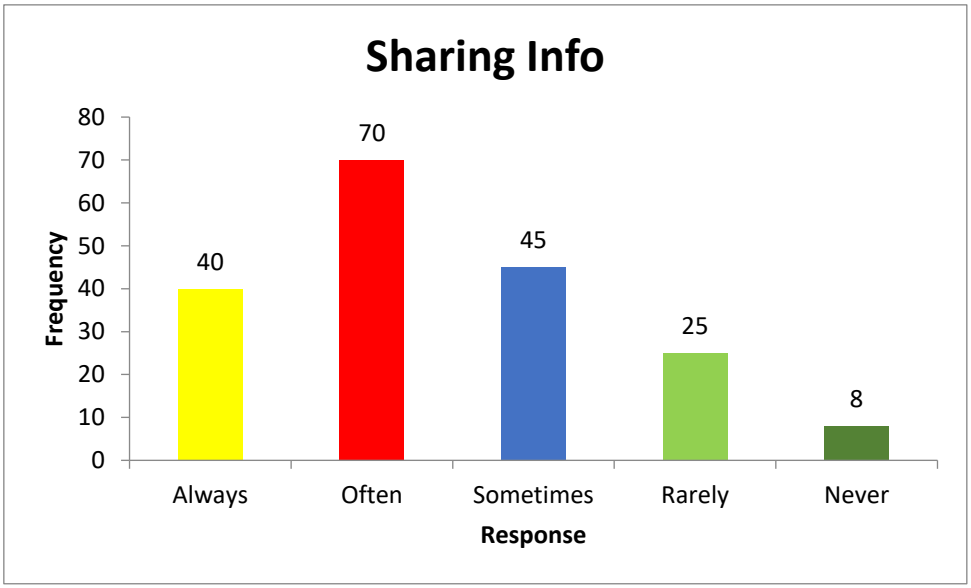

Figure 11 Sharing Info

Table 11 investigates the frequency with which respondents share information related to heat waves on Twitter. Of the 188 participants, 40 always share, 70 often share, and 45 share sometimes. Fewer respondents (25) share rarely, and 8 never share information. This indicates that a majority of users are not only consumers of information but also active disseminators. Such peer-to-peer communication behavior plays a vital role in extending the reach of heat

wave alerts and safety messages, thereby strengthening community-level preparedness and response through social media.

Table 12: Challenges		
Response	**Frequency**	**Percentage**
Difficulty understanding info	70	20
Misinformation/rumors	90	25.71
Lack of localized updates	85	24.29
Limited internet/device access	50	14.29
Language barriers	45	12.86
Other	10	2.86

Table 12 Challenges

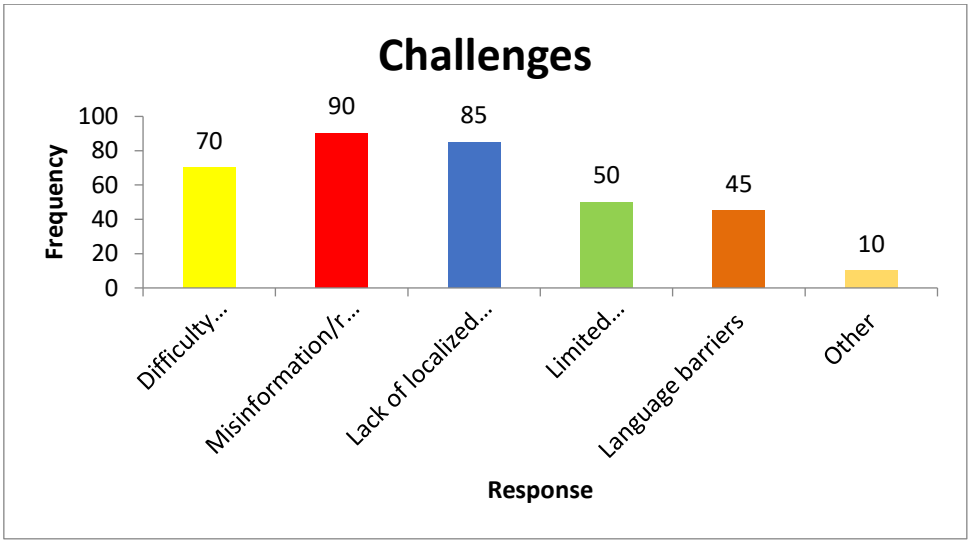

Figure 12 Challenges

Table 12 outlines the primary challenges users face in accessing or responding to heat wave-related content on Twitter. Out of a total of all the responses, misinformation and rumors were the most commonly cited challenge (90 responses), followed closely by lack of localized updates (85) and difficulty understanding information (70). Other concerns include limited internet or device access (50), language barriers (45), and a small number of other issues (10). These findings reveal that while Twitter has strong potential as a disaster communication platform, structural and content-related barriers still hinder its full effectiveness. Tackling misinformation, improving content clarity, and ensuring localized, multilingual content delivery are essential steps to enhance its role in climate risk communication.

Summary of Findings

The study investigates how Twitter is used by residents in Gaya, Bihar, during heat wave emergencies, with a focus on digital engagement, information behavior, and perceived utility. The research captures diverse perspectives from 188 Twitter users, offering valuable insights into the intersection of social media and disaster communication in the context of rising climate risks. From a scientific standpoint, the findings reveal that a majority of users (145 out of 188) are actively using Twitter either multiple times a day or at least once daily. Importantly, a substantial number (110 respondents) engage with the platform during heat wave events—indicating its relevance in real-time crisis communication. Users predominantly seek weather alerts, government advisories, and health and safety tips, underscoring Twitter's role as a hybrid source of institutional and peer-based knowledge. The perception of reliability is largely positive, with 135 respondents finding Twitter either very or somewhat reliable. Notably, over 74% of respondents (140 individuals) agree or strongly agree that Twitter helps them prepare for heat wave emergencies, affirming the platform's practical relevance in enhancing personal and community preparedness. This research extends prior work on digital disaster communication by focusing on Twitter's specific role in a tier-2 Indian city, where social media is gaining momentum but still faces challenges of digital divide and infrastructure. Unlike earlier studies that often concentrated on urban metros or general disaster scenarios, this study provides a focused micro-level analysis of heat wave-specific behavior in a climatically vulnerable region. Scientifically, the study implies that social media platforms like Twitter can play a pivotal role in democratizing access to timely disaster information, even in semi-urban or rural contexts. This decentralization of communication (where both citizens and institutions contribute to information flow) marks a shift in how disaster resilience is being digitally constructed. The identification of challenges such as misinformation, lack of localization, and digital access barriers provides targeted areas for intervention. Future studies can build on these insights by incorporating longitudinal designs to track behavioral change, integrating official data from government handles, or comparing multiple platforms such as Facebook and WhatsApp. The methodology and findings also lay a foundation for participatory disaster communication models that center community voices in preparedness strategies.

In summary, this study highlights the growing role of Twitter as a real-time, participatory, and locally relevant platform for disaster preparedness communication in Gaya. It offers empirical evidence that social media can fill communication gaps during heat wave emergencies, especially when supported by credible content and digital literacy. By mapping user behavior and preferences, the study contributes to scientific research on climate communication, digital public health, and ICT-based disaster risk reduction. It supports a shift toward more adaptive, people-centric frameworks of early warning and community resilience, particularly in underrepresented geographies. However, the study has limitations. The sample is restricted to Twitter users in Gaya, which may exclude older populations or individuals with limited digital access. Self-reported data may also carry biases in accuracy or social desirability. Despite these limitations, the findings offer actionable insights for policymakers, disaster managers, and communication practitioners aiming to harness digital platforms for climate resilience.

Conclusion

With the increasing frequency and intensity of heat waves in India, particularly in vulnerable regions like Gaya, there is a growing need to understand how communities access, share, and respond to life-saving information during such climate emergencies. While traditional early warning systems have their limitations, the rise of digital platforms like Twitter offers new avenues for real-time, community-driven disaster communication. However, the effectiveness of these platforms in rural and semi-urban contexts remains underexplored.

This study aimed to fill that gap by analyzing the behavior and perceptions of 188 Twitter users in Gaya. The findings reveal that a significant majority are active Twitter users, with many relying on the platform for weather alerts, government advisories, and health-related tips during heat wave episodes. Most respondents perceive Twitter as a reliable information source and agree that it enhances their preparedness. Engagement patterns—such as sharing information, tagging officials, and responding to content—suggest that users are not merely passive consumers but also contributors to the disaster communication ecosystem. Nevertheless, challenges such as misinformation, lack of localized content, and limited access to digital tools were identified as critical barriers. The implications of these findings are substantial. They suggest that Twitter, when used strategically, can strengthen disaster preparedness by facilitating timely, decentralized, and participatory communication. This has policy relevance for disaster management agencies, digital media strategists, and public health institutions aiming to design inclusive and responsive early warning systems. Despite its strengths, the study has limitations. The sample is restricted to digitally literate Twitter users, potentially excluding older or economically disadvantaged individuals. The cross-sectional design does not capture changes over time, and self-reported responses may contain biases. Future research could expand to multiple platforms, include longitudinal data, or examine correlations between digital engagement and actual behavioral responses during emergencies. Further, collaborations with local authorities could help assess how online communication translates into offline action. In closing, this research reinforces the emerging role of social media, especially Twitter, as a dynamic tool for climate resilience in non-metro regions. It highlights both the promise and the gaps in current digital disaster communication, urging stakeholders to invest in more inclusive, accurate, and actionable digital systems. Harnessing this potential could lead to more informed, prepared, and resilient communities in the face of escalating climate threats.

Suggestions

To enhance the effectiveness of Twitter in heat wave disaster communication, it is suggested that local authorities actively collaborate with verified Twitter accounts to issue timely, localized alerts. Efforts should be made to combat misinformation through fact-checking partnerships and promote digital literacy among rural users. Incorporating regional languages in official advisories can improve accessibility. Additionally, awareness campaigns should encourage public engagement, including tagging relevant officials and sharing accurate information. Mobile internet infrastructure must also be strengthened to ensure uninterrupted access during emergencies. These steps will ensure that Twitter becomes a more reliable and inclusive tool for community-based disaster preparedness.

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