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RESEARCH ARTICLE

EXAMINING VARIABLES INFLUENCING DIFFERENTIAL WARNING MESSAGE ACCESS

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ABSTRACT

In disaster-prone countries like Bangladesh, effective warning messages play a pivotal role in mitigating the diverse impacts on livelihoods. This study focuses on the importance of early notification systems to reduce disaster risks and enable timely actions. Jagannath University is selected as the research area due to its multicultural population from various parts of Bangladesh. The objectives encompass an investigation into the factors influencing the differentiation of perception toward the prevailing Early Warning System (EWS), as well as the correlation between perception and causal factors. A comprehensive approach involving face-to-face interviews, questionnaires, and online surveys was employed for data collection. Various statistical techniques, including frequency distribution and cross-tabulation, were utilized for analysis. The findings highlight significant variations in awareness of warning message-related information among students from different faculties (Science, BBA, Arts). The Chi-Square test affirms a notable distinction in access to warning messages across faculty members. Moreover, factors such as educational level, hometown, and gender contribute to differing perceptions of the Early Warning System (EWS). The study underscores the challenge of obtaining meaningful responses to initial warning messages, emphasizing the necessity for clear and actionable information to facilitate appropriate reactions.

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INTRODUCTION

Warning messages provide a structured approach for delivering crucial, timely information to individuals before a disaster occurs, allowing for informed decision-making and prompt action (GDPC, 2017). An integrated framework, combining hazard monitoring, forecasting, disaster risk assessment, communication strategies, and preparedness activities, empowers individuals, communities, governments, businesses, and other stakeholders to proactively reduce disaster risks prior to potential hazardous events (UNISDR, 1999). The first step of any research project is to review the sphere. It will help the researcher to consider the inclusion of variables in his research that he might not otherwise have thought about (Islam, 2008). Warnings serve three essential purposes. Primarily, they convey crucial safety information to specific audiences. Secondly, they aim to encourage safe behaviors while discouraging unsafe ones. Lastly, warnings are intended to help minimize or prevent health risks, workplace incidents, personal injuries, and property damage. These warnings can take multiple forms, including signs, labels, product instructions, lockout tags, caregiver or supervisor advisories, handouts from safety meetings, and even auditory signals (Michael S. Wogalter, 2011).

While the current early warning dissemination system has proven effective in lessening the impact on lives and property, there remains room for enhancement from a community perspective. Flag-based warnings, for instance, are not always clearly understood by local populations. Education through community training, alongside revising warning messages to provide detailed information-such as intensity levels, target zones, and evacuation timelines could improve comprehension. Introducing additional warning methods could also enhance the system's reliability and efficiency (Dhar & Ansary, 2008). In the United States, a comprehensive national warning strategy for all hazards is lacking, with warning responsibilities distributed across various governmental levels and the private sector. This fragmentation leads to uneven preparedness, leaving communities inconsistently protected from sudden natural disasters. Although significant advancements have been made in forecasting certain hazards, such as floods, hurricanes, and volcanic eruptions, and dissemination for hurricane warnings has notably improved, no system guarantees 100% reliability for any hazard(Sorensen, 2000). Flood impacts and vulnerabilities, particularly affecting low-income populations, remain a globally significant concern. In Nepal, floods have long posed challenges, and their frequency has increased due to climate change, heightening

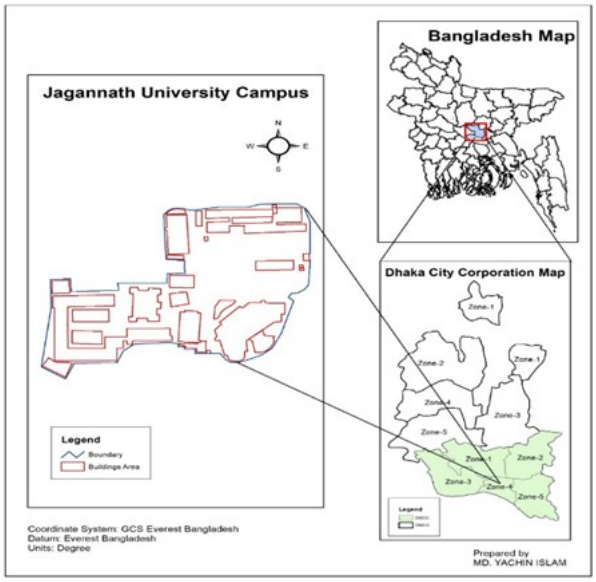
risks for people living along riverbanks. This study aims to evaluate community perceptions of the current Early Warning System (EWS) and their response mechanisms during floods in Padariya 7, Bhandara VDC, Chitwan district, Nepal. To gather data, participatory tools—such as Resource Mapping, Timeline Analysis, Focus Group Discussions, and Key Informant Interviews (KII)—were utilized to validate findings. Community members expressed that while the current system is perceived as ineffective for local warning dissemination, they recognize its potential value if effectively employed for flood forecasting and hazard warnings (Lamichhane, 2011). The EURO Flood Research Project, funded by the European Commission (EC) under the EPOCH program, assesses the development levels of flood forecasting, warning, and response systems (FFWRS) across the European Union (EU) in areas affected by riverine and tidal flooding, including the Netherlands, UK, Germany, France, and Portugal. These FFWRS systems have evolved to address unique water management challenges, distinct flood types, and varying historical, cultural, and institutional influences (Parker & Fordham, 1996). The paper titled "Disaster Knowledge Factors in Managing Disasters Successfully" aims to identify and chart crucial knowledge factors for effective disaster management by capturing best practices and lessons learned. Disasters typically cause loss of life, property damage, and harm to infrastructure and the environment. Recognizing key knowledge factors for disaster management could significantly improve response and preparedness. This study, "Disaster Knowledge Factors: Benefits and Challenges," seeks to identify these critical knowledge success factors by capturing practical strategies and lessons from past events (Seneviratne, Pathirage, Amaratunga, & Haigh, 2011). The objective of this paper is to represent the literature findings on factors that support successful disaster management. Accordingly, the known factors were classified into eight main classes as technological, social, legal, environmental, economic, functional, institutional, and political (Seneviratne, Baldry, & Pathirage, 2011). In Bangladesh, repeated Tropical Cyclones (TCs) over the years have led to significant challenges. Despite disaster management initiatives by organizations like the Bangladesh Meteorological Department (BMD), lapses in evacuation behavior have been observed (Roy & Kovordanyi, 2015). The paper "Warning Systems as Social Processes for Bangladesh Cyclones" examines how warning systems function as social processes and considers how people in two Khulna district villages perceive and act on cyclone warnings. Residents generally trusted the cyclone warnings but highlighted issues such as inadequate road access to cyclone shelters, which led them to consider alternative evacuation options when necessary (Kelman et al., 2018).

This research aims to analyze public perception of forecasting and warning and identify factors that influence differing perceptions of the existing Early Warning System (EWS). In Bangladesh, the Bangladesh Meteorological Department (BMD), operating under the Ministry of Food and Disaster Management, is responsible for generating warnings across hazard types, broadcasting these warnings through various public channels, and maintaining follow-up alerts at set intervals. This study seeks to assess public perception of forecasting and warning, examine responses to these warnings, and identify underlying causes and influencing factors in perception of the current EWS, ultimately promoting its sustainability. The following are the major objectives of this study:

- Understanding the factors that influence varying perceptions of the existing Early Warning System (EWS) and
- Exploring the connection between public perception of the EWS and the contributing factors.

PROFILING STUDY AREA

Jagannath University (JnU) is in the heart of Bangladesh. There are many people coming from different parts of Bangladesh having multi-cultural characteristics. This prestigious academic institution includes a history of regarding 156 years that started in 1858 once Dhaka Brahma School was based in 1858 by Dinanath Sen, Prabhaticharan Roy, Anathbandhu Mallik and Brajasundar Kaitra. Jagannath University is situated in Kotwali Thana, Dhaka. It is under the Dhaka South City Corporation (DSCC). The area is located between 23° 42 ′37″ N and 90° 24′ 40″ E. The total area of the campus is 15.75 acres (Wikipedia, 2019).



Source: LGED and field survey, 2022.

Fig. 1. Study area map

Jagannath University (JnU) has thirty-six departments under seven faculties. Each department follows the semester system. Now 601 faculty members are engaged in providing quality education to 22,335 students in Honors, Masters, M.Phil., and Ph.D. programs. There are six faculties and two institutions in Jagannath University. Today 36 departments are running at JnU.

MATERIALS AND METHODS

The study was conducted based on both primary and secondary data. The study is mainly based on primary data. Primary data is collected by questionnaire survey and online survey through Google form. A questionnaire is a list of questions sent to several individuals for them to answer. It secures unvarying results that can be tabulated and treated statistically (Ghosh, 1992). According to Baruch & Holtom (2008), questionnaires are the most frequently used tools in acquiring information within the managerial and behavioural sciences. Based on the surveyed literature, the study has made a questionnaire to collect primary data from the students.

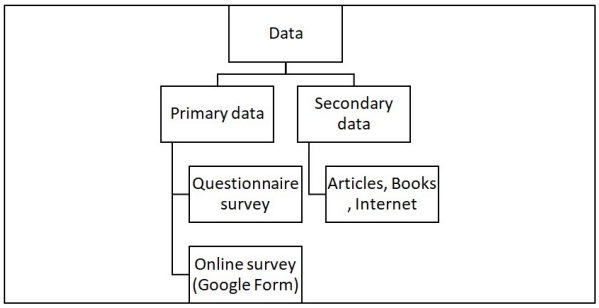


Fig. 2. Data sources

A Google form is also created for collecting information from the faculty members of JnU. Secondary data also has been collected to increment the primary data from various sources. These include books, journals, articles, unpublished thesis, project paper and website (published & unpublished). After editing and coding, collected data have been put in computer. Then all the data have been analysed by different statistical techniques such as frequency distribution and cross tabulation by using SPSS software 25 and Microsoft Office Excel. Finally, the analysed data has been presented as tables and graphs.

RESULTS AND DISCUSSION

From the survey, most of the respondents are 18-22 years old and the percentage is 70.2%. The second maximum respondents are 23-27 years old, and the percentage is 16%. Percentages of the people year of 42-47 are very low at about 1.1%. Most of the respondents are male and the percentage is 58.5%. The percentage of female respondents is 41.5% (fig. 3). Table-1 shows that about 72.3% are undergraduate students and 12.8% are master's students. 2.1% of respondents are the professor and others are associate professor, assistant professor, and lecturer.

Table. 1. Designation/Level of study

Designation/Study Level	Frequency	Percentage
Lecturer	2	2.1
Assistant Professor	7	7.4
Associate Professor	3	3.2
Professor	2	2.1
Undergraduate	68	72.3
Master's	12	12.8
Total	94	100

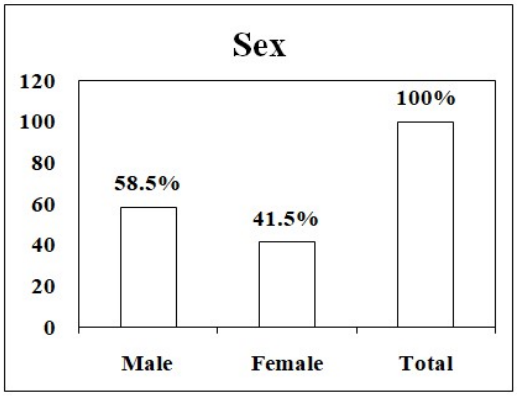


Fig. 3. Sex of the respondent

All the respondents have a mobile phone and 40.4% of respondents have a laptop. Only 8.5% respondents have radio device. Most of them have a smartphone and 89% of their phone operating system is Android system. Others are iPhone and windows operating system. As BD is a digital country, all the respondents are using the internet. 80.9% of respondents use Wi-Fi, 56.4% use mobile data packages and other broadband connections. 52.1% of respondents are using weather apps but most of them have system built-in weather apps. Only some of them have BMD weather apps and the percentage is 2.2%. IVR (Interactive Voice Response): Initiative have been taken to weather, flood forecasting and early warning for river port through IVR. The Service is available through all mobile subscribers. IVR Hot Line – 10941.

Only 2.1% of respondents know the emergency phone number of weather forecasting in case of a disastrous event occur. More than 95% of respondents don't know the number. BMD is responsible for maintaining the network of surface and upper air observatories, radar and satellite stations, agrometeorological observatories, geomagnetic and seismological observatories, and meteorological telecommunication system of Bangladesh. It provides different types of weather forecasting news. Only 17% of respondents know the BMD website. The Meteorological Department uses separate codes of signals for storm warnings at maritime and river ports. It should be noted that the signal numbers in the two codes do not carry the same significance and that higher signal numbers within the danger and great danger maritime groups indicate differences in storm location does not difference in storm intensity. Only 30% of respondents know the maritime port signals. And only 10.6% people know the river port signals used in storm warning signals. Most of the respondents know the weather-related information through social media and the percentage is 70.2%. Others also know the information from newspapers, radio, and television etc. CPP has developed 3 flags that using in the warning message. Most people don't know their meaning. Only 4.3% of respondents know their meaning appropriately (fig. 4).

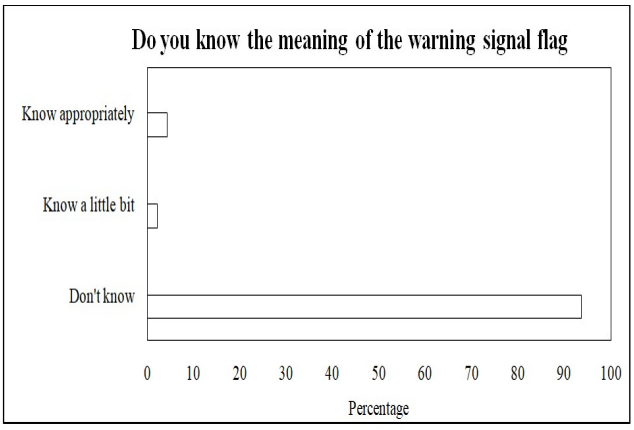
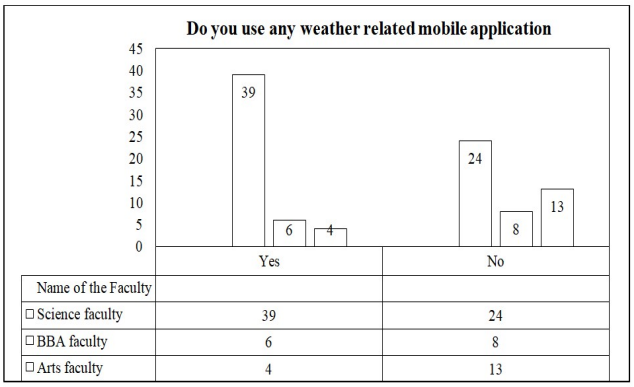


Fig. 4. This figure shows that how many respondents know the meaning of the warning signal flag.

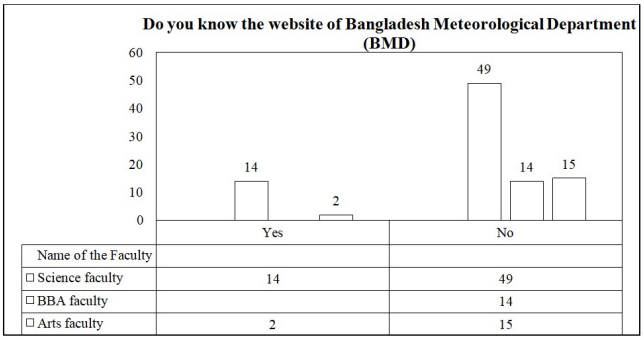
From the figure 5, we can see that the highest percentage of respondents using weather apps are from science faculty. Those who have weather apps from the BBA and Arts faculty are mostly mobile phone system built-in apps.



Name of the Faculty		
Science faculty	39	24
BBA faculty	6	8
Arts faculty	4	13

Fig. 5. This figure shows that how many respondents use weather-related mobile applications

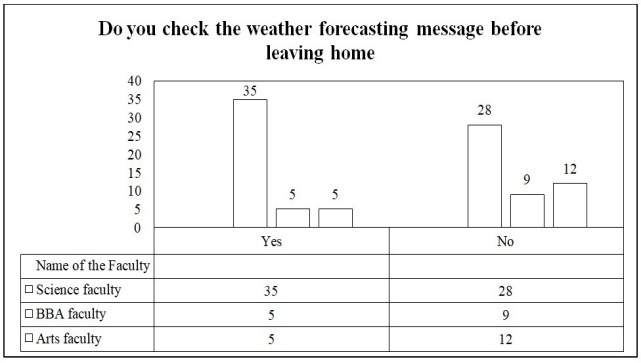
From the figure 6, we can see that only two people know the BMD website from the Arts faculty and from the BBA faculty, the percentage is zero. BMD is responsible for maintaining the network of surface and upper air observatories, radar and satellite stations, agrometeorological observatories, geomagnetic and seismological observatories, and meteorological telecommunication systems of Bangladesh. It provides different types of weather forecasting news.But very few respondents know the website and they visit the BMD website occasionally.



Name of the Faculty		
Science faculty	14	49
BBA faculty		14
Arts faculty	2	15

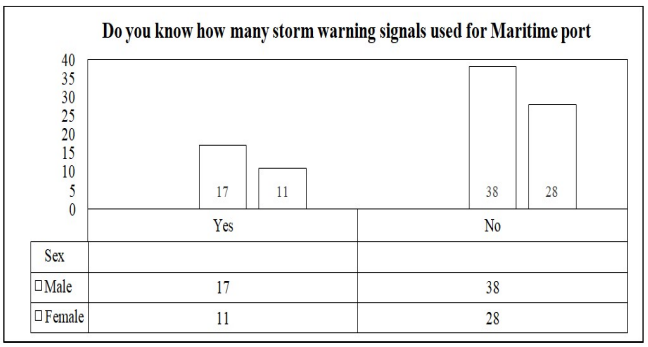
Fig. 6. This figure shows that how many respondents know the website of Bangladesh Meteorological Department (BMD)

From figure 7, we can also see that very few respondents are checking weather forecasting message before going outside or leaving home such as excursion/tour, international tour, business purpose etc.



Name of the Faculty		
Science faculty	35	28
BBA faculty	5	9
Arts faculty	5	12

Fig. 7. This figure shows that how many respondents check the weather forecasting message before leaving home.



Sex		
Male	17	38
Female	11	28

Fig. 8. This figure shows that how many respondents know the storm warning signals used for Maritime ports

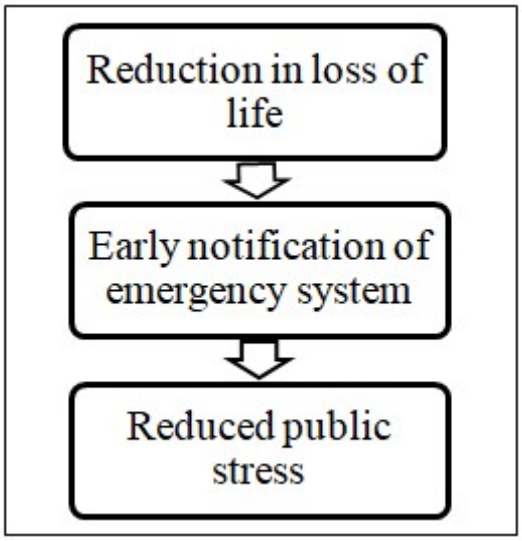


Fig. 9. Benefits of Early warning messages

Other controlling factors such as level of study. Sex, home district etc. also responsible for in differentiation of perception toward the prevailing Early Warning System (EWS).

MAJOR FINDINGS

- The result of the study revealed that the percentage of knowing the warning messages related information varied among the students of different faculties (Science, BBA, Arts).
- According to the Chi-Square test, the alternative hypothesis is accepted as there is a significant difference between the faculty members on the access to warning messages.
- Other controlling factors such as level of study, home district, sex etc., are also responsible for the differences in perception towards the prevailing Early Warning System (EWS).
- The percentage of respondents of storm warning signals used for maritime ports & river ports are respectively 30% and 11%.
- Receivers of warning messages seldom reply to the initial message.

RECOMMENDATION

The primary challenges for nations involve, firstly, establishing or enhancing institutional capacities, and secondly, effectively involving impacted communities within the system.

National actions for early warning systems should be integrated into the national framework to substantially support its implementation.

In light of this, the following key responsibilities are suggested:

- The emergency planning process should incorporate plans for each specific community hazard, forming a comprehensive strategy for multi-hazard management.
- The Bangladesh Meteorological Department (BMD) should distribute warnings through public media and other preparedness channels, with regular follow-ups on issued notifications.
- The government should strengthen institutional foundations to support a nationwide early warning system.
- Authorities should work to enhance the dissemination of warning messages at the community level.
- Coordination, along with sharing of knowledge and skills, should be bolstered at the provincial level.
- Create mandatory programs and a public education initiative that reaches the population at least once a year, increasing awareness of risks, the nature of warnings, and the necessary responses.
- Educational institutions should include a mandatory course on early warning systems, ensuring individuals gain this knowledge from an early stage.

CONCLUSION

Warning messages help us to make more informed daily decisions and may even help keep us out of danger. It helps to predict natural calamities such as floods and destructive winds and ensure necessary precautions are taken. Recipients of warning messages rarely respond to the initial message. For people to understand warnings, they need to contain clear, helpful information that enables proper responses. Government and other organizations should work together for disaster warning generation and dissemination of the warning to the root-level people in Bangladesh.

DECLARATION: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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