# AN EMPIRICAL STUDY ON DISASTER PREPAREDNESS AMONG FIRE STATION EMPLOYEES

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## ABSTRACT

This study investigates disaster preparedness among fire station employees, focusing on their knowledge, training, and readiness to respond effectively during emergencies. The research highlights the crucial role of continuous training, resource allocation, and cross-functional teamwork in building resilient emergency response teams. Many research studies on disaster preparedness have predominantly focused on the medical sector, overlooking fire station employees. Existing literature often generalizes findings across emergency services, missing fire-specific challenges. Few studies assess individual preparedness, training, and perception among firefighters. This creates a clear gap in understanding disaster readiness within fire stations. It aims to assess the existing protocols, challenges, and strategies for disaster response within fire stations. Data for this study was collected from 250 respondents through surveys with fire station personnel, the research evaluates their level of preparedness for different types of disasters, such as fires, natural calamities, and chemical accidents. The sampling method used in this study was purposive sampling, and statistical tools were analysed using descriptive statistics, independent sample t-test, one-way ANOVA, and exploratory factor analysis. This study finds out disaster preparedness behaviour in training, resources, and coordination with other emergency services, offering recommendations for improving disaster response efficiency. The findings will contribute to enhancing disaster preparedness strategies and ensure that fire station employees are adequately equipped to safeguard lives and property during crises. The conclusion of the study, fire station employees are ready to accept the natural and man-made disaster situations through the adequate training of disaster preparedness.

**Keywords:** Disaster, Preparedness, Risk Reduction, Emergency, Employees

### 1 Introduction

A disaster refers to an unexpected and devastating event that greatly interrupts the regular operations of a community or society. It causes major human, material, eco- nomic, or environmental damage that exceeds the community's ability to manage and respond using its own resources. Disasters can be categorized into two main types: natural and man-made. Natural disasters include events like earthquakes, floods, tornadoes, hurricanes, ice storms, volcanic eruptions, tsunamis, and other weather-related phenomena. Man-made disasters, on the other hand, are caused by human activities and can include chemical spills, fires, nuclear accidents, biological and chemical terrorism, war crimes, transportation accidents, and explosions.

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However, the sixth anniversary report of the Sendai Framework challenges the use of the term “natural disaster.” The report highlights that factor such as global fossil fuel usage, insufficient international cooperation to support developing countries and their health systems, environmental degradation, unchecked urbanization, and widespread poverty all contribute to the increasing frequency and severity of disasters. This calls for urgent global cooperation to reassess priorities and take decisive action to reduce these pressing threats. Disasters, whether natural or man-made, pose a threat to all regions of the world, with challenges ranging from disease outbreaks and unsafe food and water to war, conflicts, and extreme weather events Abu Hasheesh and O (2023a).

Organizations in various sectors such as healthcare, oil and gas, education, and finance have different operational structures and face unique disaster management challenges. The potential impact on essential infrastructure and services makes it clear that a one-size-fits-all approach is inadequate. The varying effects of disasters across sectors require disaster management practices that are tailored to each sector’s needs. Additionally, an organization’s geographic location adds another layer of complexity. Just as sectors have different vulnerabilities, organizations in different regions face distinct types of disasters, which further highlights the importance of customized preparedness strategies Al-Husain (2023).

This dual responsibility has created an urgent need to evaluate how well hospitals are prepared for unexpected disruptions, considering their resources, training, and overall readiness. The idea of business continuity, therefore, goes beyond borders, cultures, and economies, embodying a shared goal: to protect life and well-being, even during times of crisis. In recent years, sustainability has become increasingly important in healthcare, encompassing not just environmental responsibility but also the resilience and long-term stability of healthcare systems.

The first phase of disaster management is preparedness, which involves taking proactive steps before a disaster occurs. This includes setting up warning systems, organizing evacuation and transportation logistics, stockpiling essential resources like food and water, conducting drills and simulations, and creating detailed management plans.

The second phase, mitigation, focuses on actions aimed at reducing the impact of a disaster. This includes assessing hazards and risks, analysing vulnerabilities, allocating resources, and cross training staff. The third phase is response, where disaster plans are quickly activated, incident command systems are put in place, staff are mobilized, kits and equipment are distributed, patients are treated, and additional relief measures such as food and shelter are provided. The final phase, recovery, is dedicated to restoring well-being and rebuilding structures and services, with the goal of returning to normal, which can take anywhere from a few weeks to several years. Aqtam et al (2024).

Bangladesh is highly vulnerable to various natural disasters, which occur every year, including floods, cyclones, storm surges, flash floods, droughts, tornadoes, riverbank erosion, and landslides. Flooding is particularly prevalent due to the country’s geographic location and causes significant loss of life and widespread damage. Bangladesh is home to 57 transboundary rivers, with 54 flowing in from India and the remaining three originating in Myanmar. The Ganges, Brahmaputra, and Meghna rivers, which primarily flow through Bangladesh from India, are influenced by the monsoon seasons, which directly impact major flood events, especially in the border. The northeastern districts of Sylhet and Sunamganj, which are near India, frequently face floods, with 2022 witnessing the most severe flooding in 122 years. Over nine million people were displaced, and many lost their homes and possessions Tohan et al (2024).

While raising awareness is crucial, it is equally important for students to be equipped with essential rescue skills that can significantly reduce the impact of dis- asters. These skills are a key component of disaster education and should be taught by qualified professionals. Universities that have nursing or medical schools are at an advantage because they have access to the necessary resources and expertise to create and

carry out effective disaster training programs. Despite being among the most vulnerable during natural disasters, students are often neglected in disaster preparedness initiatives. University students are unique in their broad perspective and exceptional adaptability, which allows them to learn emergency skills more quickly and effectively than the general population. Since training students can substantially reduce the costs of disaster damage and make them valuable assets in disaster response, prevention, and mitigation, it is highly recommended to provide them with proper training and education Patel et al (2023)**.** Ongoing and unpredictable disasters continue to pose a significant threat to global public health and property. In mainland China, the primary entities involved in disaster relief include national emergency medical rescue teams, private rescue organizations, and healthcare facilities. Among these, healthcare facilities are considered crucial emergency response resources, as they play a central role in delivering prompt and high-quality healthcare services to those injured. With the rise in disaster events, healthcare facilities are expected to strengthen their frontline capabilities to effectively respond to disaster-related disruptions Abu Hasheesh M. O (2023)**.** This study is mainly to focus on the relationship between fire station employees' pro- file of demographic and preparedness of disasters. Disaster preparedness has emerged as a key theme in the literature review. Patel et al (2023) **i**dentified 29 DPE's; the list of DPE's is presented in Table **1**.

**Table 1. List of DPE's.**

| # | Disaster Preparedness Evaluation |
|---|---|
| 1. | I would be interested in educational classes on disaster preparedness. |
| 2. | I know the limits of knowledge used in disaster situations. |
| 3. | I am aware of exploring potential skills in disaster situations. |
| 4. | I found out about past experience on disaster preparedness. |
| 5. | I know who to contact in disaster situations. (Health Department). |
| 6. | I read information related to disaster preparedness (article). |
| 7. | I know where to collect the unknown information related to disaster management. |
| 8. | I collected disaster preparedness information which is easily accessible. |
| 9. | There is sufficient support from officers in disaster situations. |
| 10. | I am aware of public awareness classes about disaster preparedness and management. |
| 11. | I have participated in emergency planning for disaster situations. |
| 12. | I have participated in creating new guidelines for emergency situations plans at the local or national level. |
| 13. | In case of a biological attack, I know how to use equipment to protect yourself. |
| 14. | In case of a biological attack, I know how to execute procedures to sanitize. |
| 15. | I consider myself prepared for the management of disaster situations. |
| 16. | I would be able to lead the team in a disaster situation. |

17. I have personal emergency plans for disaster situations.
18. I am familiar with psychological and behavioural therapy for patients who experience 18
19. emotional or physical injury.
20. I am able to describe my role in a disaster situation to the public.
21. I am familiar with the private agencies in disaster situations.
22. I have accepted all the principles in the disaster situations.
23. In the case of bioterrorism, I know how to minimize the risks.
24. I can treat patients without supervision of a physician in disaster situations.
25. I am confident in working for setting up temporary clinics in disaster situations.
26. I am confident in providing patient education on stress.
27. I am familiar with the scope of my role in post-disaster situations.
28. I am able to notice severe stress symptoms in post-disaster situations.
29. I am confidently providing training for disaster situations and management.
30. I am familiar with how to perform health focus for disaster situations.

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The statements reflect strong awareness and involvement in disaster preparedness among fire station employees. They show interest in education and public awareness, knowledge of emergency procedure including biological threat and confidence in leading, planning, and responding during disasters. Individuals are familiar with their roles, can work independently, support psychological care, and contribute to developing and implementing emergency guidelines. Overall, it indicates a well-prepared and capable workforce for disaster situations.

**2 Scope and research problem**

This study focuses on evaluating the disaster preparedness of fire station employ- ees, including their training, knowledge, confidence, and involvement in planning and response activities. It aims to assess both institutional and individual readiness, highlight gaps, and recommend strategies to strengthen preparedness.

Despite being frontline responders, fire station employees often receive limited attention in disaster preparedness research, which has largely focused on hospitals and healthcare facilities. There is insufficient empirical data on their preparedness levels, training effectiveness, and awareness, leaving a critical gap in understanding how well- equipped they are to handle complex disaster scenarios.

**3 Review of literature**

Aqtam et al. (2024) studied that Pandemics emergencies are increasingly frequent, requiring specialized management to mitigate social disruption. This study aims to evaluate disaster management preparedness among nurses and physicians during pandemics. Data was gathered through an online survey conducted in late 2022, using purposive sampling from both public and private hospitals in Palestine. The survey included responses from 512 nurses and 241 physicians across different hospital units. The findings reveal varying levels of knowledge, with 67% of participants reporting no prior experience with real disaster situations, and 63% lacking disaster response experience. Additionally, 17.8% of participants prioritized

training in emergency preparedness, mass casualty trauma response, and triage disaster management systems. This emphasizes the importance of ensuring healthcare workers are adequately prepared for emergencies through standardized training and ongoing professional development.

Patel et al. (2023) this article assesses the students' socio-demographics and disaster preparedness indicators (DPIs) influence their awareness of disaster risks and coping abilities. A survey was carried out among university students to explore their perceptions regarding disaster risk reduction. Structural equation modelling was used to analyse how socio-demographics and DPIs affect disaster awareness and preparedness. The findings highlight the importance of curriculum and emergency procedures in enhancing students' disaster awareness and preparedness, guiding universities and policymakers to improve disaster response strategies.Al-Husain (2023) indicated how the organizational characteristics such as type, location, sector, and size affect perceived disaster management competence in Kuwait. A cross-sectional survey with 438 participants was conducted to assess disaster management practices across the disaster management cycle: mitigation, preparedness, response, and recovery. Using chi-square and ANOVA tests, the study found that organization type, location, and sector influenced preparedness, response, and recovery, but had no significant impact on mitigation. These findings offer valuable insights for policymakers and leaders in crafting disaster management strategies tailored to organizational characteristics. The study emphasizes the need for context-specific strategies in disaster management, particularly tailored to Kuwait and similar settings.

AlDulijand et al. (2024) examine the resilience and sustainability of healthcare services in Saudi Arabia's Eastern Province, focusing on their preparedness for disaster scenarios. A survey of 522 hospital employees assessed aspects like safety, disaster response training, and resource management during emergencies. The results highlight significant disaster preparedness, with 53.7% of hospitals implementing recovery plans and 70.6% of employees receiving disaster response training. The study emphasizes the proactive efforts of hospitals in fostering a sustainable healthcare framework. These findings underscore the importance of long-term preparedness to ensure healthcare continuity during crises.

## 4 Research questions

- Is there a significant difference in disaster preparedness behaviour between married and unmarried fire station employees?
- Does marital status influence the level of participation in disaster training and response • activities?
- Is there a significant difference in disaster preparedness levels between male and female fire station employees?
- How does gender affect confidence and readiness in responding to disaster situations among fire service personnel?
- What are the key factors that influence disaster preparedness behaviour among fire station employees?

## 5 Objectives of the study

- To find out the differences between marital status and disaster preparedness behaviour.
- To determine mean differences between gender and disaster preparedness.
- To analyse influencing factors on disaster preparedness.

## 6 Research methodology

The research methodology adopted for this study utilized non-probability sampling, specifically purposive sampling. Purposive sampling is a non-probability sampling technique where participants are selected based on specific characteristics or qualities that are relevant to the research. This method ensures that the sample directly aligns with the study's objectives or research questions. This method ensured that only individual with specific characteristics were included. The study relied on both primary and secondary data to gather comprehensive insights. Egmore Fire Station, being a central hub in South Chennai, has around

150 employees, whereas Guindy and Velachery Fire Stations have 50 employees each. Primary data was collected through field survey by questionnaire, while secondary data was sourced from published reports and article. To analyse the collected data, statistical tools like descriptive statistics, independent sample t-test, one-way ANOVA and factor analysis were used for ensuring interpretation of the findings.

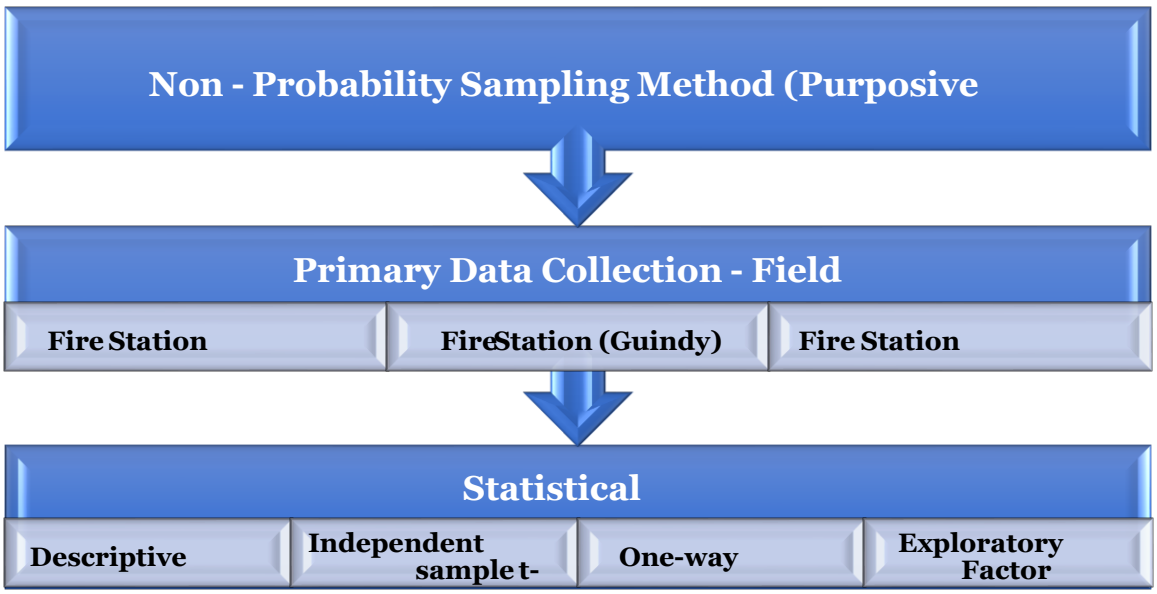


**Figure 1: Research Methods**

### 7 Data analysis

The majority of respondents were male (92.4%) and aged between 21-30 years (50.8%), with 54.8% were being married. Most had a bachelor's degree (57.6%) and a monthly income ranging from Rs.15001 to Rs.30000 (31.2%). A significant portion (67.2%) had received formal training courses, including disaster rescue simulations (90.4%) and disaster relief training (86.8%). Experience in handling disasters was reported by 85.2%, with 86.8% demonstrating the ability to manage disaster situations. The willingness to join the disaster response initiatives was noted in 59.2%, while 55.2% had less than 5 years of experience. Regarding the number of disasters, they we involved in, 46.8% had participated in 1 to 5 events.

**Table 2. Descriptive statistics of the fire station employees**

| Demographic Characteristics | Sub-category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Gender** | Male | 231 | 92.4 |
| | Female | 19 | 7.6 |
| **Age** | Below 20 | 16 | 6.4 |

| Demographic Characteristics | Sub-category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| | 21–30 | 127 | 50.8 |
| | 31–40 | 57 | 22.8 |
| | 41–50 | 19 | 7.6 |
| | Above 50 | 31 | 12.4 |
| **Marital Status** | Married | 137 | 54.8 |
| | Single | 113 | 45.2 |
| **Educational Qualification** | SSLC | 33 | 13.2 |
| | HSC | 18 | 7.2 |
| | Diploma | 43 | 17.2 |
| | Bachelor's Degree | 144 | 57.6 |
| | Others | 12 | 4.8 |
| **Monthly Income** | Less than Rs. 15,000 | 13 | 5.2 |
| | Rs. 15,001–30,000 | 78 | 31.2 |
| | Rs. 30,001–45,000 | 77 | 30.8 |
| | Rs. 45,001–60,000 | 34 | 13.6 |
| | More than Rs. 60,000 | 48 | 19.2 |
| **Disaster Management Training Received** | Course | 168 | 67.2 |
| | Workshop | 82 | 32.8 |
| **Participation in Disaster Rescue Simulations** | Yes | 226 | 90.4 |
| | No | 24 | 9.6 |
| **Disaster Relief Training Experience** | Yes | 217 | 86.8 |
| | No | 33 | 13.2 |
| **Experience in Disaster Response** | Yes | 213 | 85.2 |
| | No | 37 | 14.8 |
| **Willingness to Join Disaster Relief Missions** | Yes | 148 | 59.2 |
| | No | 102 | 40.8 |
| **Experience in Handling Disasters** | Yes | 216 | 86.4 |
| | No | 34 | 13.6 |
| **Years of Experience in Disaster Management** | Less than 5 Years | 138 | 55.2 |
| | 5–10 Years | 62 | 24.8 |
| | More than 10 Years | 50 | 20.0 |
| **Number of Disasters Involved In** | 1–5 | 117 | 46.8 |
| | 6–10 | 56 | 22.4 |

| Demographic Characteristics | Sub-category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| | 11–15 | 29 | 11.6 |
| | 15–20 | 23 | 9.2 |
| | More than 20 | 25 | 10.0 |

**Table 3. Independent Sample t-test results for the differences between marital status and disaster preparedness behaviours.**

| Variables | Married (n = 137) | | Single (n = 113) | | t (248) | Sig. (2-tailed) | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | | Lower | Upper |
| Scores | 1.203 | 0.207 | 1.161 | 0.191 | 1.648 | 0.101 | -0.008 | 0.092 |

**HYPOTHESIS 1**

H0: There is no significance difference between marital status and disaster preparedness behaviours.

H1: There is a significance difference between marital status and disaster preparedness behaviours.

The results shows that the t value is 1.648. The significant value is 0.101 which is above 5% level of significance. Hence, the null hypothesis is accepted. There is no differences between marital status and disaster preparedness behaviours.

**Table 4. One-way ANOVA Test Results for Mean Difference in Disaster Preparedness by Gender**

| Demographic Profile | Category | N | Mean | SD | F | Sig. |
|---|---|---|---|---|---|---|
| Gender | Male | 231 | 1.120 | 0.327 | 5.741 | 0.017 |
| | Female | 19 | — | — | | |

**HYPOTHESIS 2**

H0: There is no significance mean difference between gender and disaster preparedness.

H1: There is a significance mean difference between gender and disaster preparedness.

The results shows that the F-value is 5.741. The significant value is 0.017 which is less than 5% level of significance. Hence, the null hypothesis is rejected. There is a mean difference between gender and disaster preparedness.

The Cronbach's alpha coefficient value of 0.912 indicates a high level of reliability for the set of 24 items that were tested. In general, a Cronbach's alpha value above .70 is considered acceptable for research purposes, while values above .90 indicates high levels of reliability. The N of items refers to the total number of items that are tested. In this case, there are 24 items included in the test. The largest number of items that are tested, the more reliable the test is likely to be, as long as the items are measuring the same construct or trait. Overall, based on the information provided, the reliability statistics suggest that the test is highly reliable and that the 24 items are likely to be measuring the same construct or trait consistently. Exploratory factors analysis with principal components and varimax rotation method used for extracting the factors of disaster preparedness. However, poor factor loadings were executed from the analysis, (# 3,5,11,21,25). The KMO and Bartlett's Test value is 0.893, to be greater than value of 0.5 with Total Variance Explained was 58.665 percentage. The analyses healed 6 factors, Disaster Preparedness Skills, Disaster Preparedness Engagement, Disaster Preparedness Awareness, Disaster Management Readiness, Disaster Medical Competence and Bioterrorism Response Preparedness

**Table 4. Exploratory Factor Analysis**

| Component Name | Item No. | Statement | Factor Loading |
|---|---|---|---|
| **Disaster Preparedness Skills** | 6 | I read information related to disaster preparedness articles. | 0.677 |
| | 7 | I know where to collect unknown information related to disaster management. | 0.569 |
| | 8 | I collected disaster preparedness information that is easily accessible. | 0.612 |
| | 14 | In case of a biological attack, I know how to execute procedures to sanitize. | 0.523 |
| | 16 | I would be able to lead the team in a disaster situation. | 0.663 |
| | 27 | I am able to notice severe stress symptoms in post-disaster situations. | 0.577 |
| **Disaster Preparedness Engagement** | 4 | I found out about past experience on disaster preparedness. | 0.522 |
| | 10 | I am aware of public awareness classes about disaster preparedness and management. | 0.666 |
| | 12 | I have participated in creating new guidelines for emergency situation plans at the local or national level. | 0.612 |

| Component Name | Item No. | Statement | Factor Loading |
|---|---|---|---|
| | 17 | I have personal emergency plans for disaster situations. | 0.565 |
| | 18 | I am familiar with psychological and behavioural therapy for patients who experience emotional or physical injury. | 0.606 |
| **Disaster Preparedness Awareness** | 1 | I would be interested in educational classes on disaster preparedness. | 0.682 |
| | 19 | I am able to describe my role in a disaster situation to the public. | 0.701 |
| | 20 | I am familiar with private agencies involved in disaster situations. | 0.517 |
| **Disaster Management Readiness** | 9 | There is sufficient support from officers in disaster situations. | 0.633 |
| | 15 | I consider myself prepared for the management of disaster situations. | 0.652 |
| | 28 | I am confident in providing training for disaster situations and management. | 0.550 |
| | 29 | I am familiar with how to perform health-focused care during disaster situations. | 0.532 |
| **Disaster Medical Competence** | 2 | I know the limits of knowledge used in disaster situations. | 0.600 |
| | 23 | I can treat patients without the supervision of a physician in disaster situations. | 0.577 |
| | 24 | I am confident in setting up temporary clinics in disaster situations. | 0.639 |
| **Bioterrorism Response Preparedness** | 13 | In case of a biological attack, I know how to use protective equipment. | 0.578 |
| | 22 | In the case of bioterrorism, I know how to minimize the risks. | 0.691 |
| | 26 | I am familiar with the scope of my role in post-disaster situations. | 0.522 |

## 8. Implications and future research

Regular disaster preparedness training should be conducted and tailored based on employees' experience and previous disaster exposure. Fire stations should improve access to updated information through digital platforms. Psychological preparedness, including stress and trauma training, must be integrated into regular drills. Leadership development programs should be offered to enhance on-ground coordination during emergencies. Fire personnel should be actively involved in planning and decision-making processes. Equipment must be routinely checked and upgraded to ensure readiness. Collaboration with health departments and private agencies can strengthen response capabilities.

Future research can explore disaster preparedness comparisons across different regions and emergency services. Studies on the impact of technology, like VR training or mobile apps, would offer modern insights. Further investigation into the role of gender and diversity in preparedness behaviour could reveal valuable trends.

## 9 Conclusion

This empirical study on disaster preparedness among fire station employees underscores the importance of comprehensive training, effective coordination, and resource management in disaster response. Firefighters play a crucial role not only in managing fire-related incidents but also in broader emergency scenarios. Enhancing disaster preparedness within fire stations will not only improve response times and save lives but also build community resilience in the face of increasingly frequent and diverse disasters. A well-prepared fire service is an essential component of a nation's ability to cope with and recover from disasters, making it vital to invest in training, mental health support, and resources to ensure that these first responders are equipped to handle any emergency situation.

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