Incidence of Acute Respiratory Infections during Disasters in the Absence and Presence of COVID-19 Pandemic

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Event: Heavy Rains with Flooding (West Japan; Kumamoto)
Event Onset Date(s): June 28, 2018; July 3, 2020
Location(s) of Report: Hiroshima, Okayama, Ehime Prefecture for West Japan; Kumamoto Prefecture for Kumamoto
Response Dates: July 8-September 11, 2018; July 5-31, 2020
Response Type: Humanitarian/Medical Relief

Abstract

Introduction: Japan recently experienced two major heavy rain disasters: the West Japan heavy rain disaster in July 2018 and the Kumamoto heavy rain disaster in July 2020. Between the occurrences of these two disasters, Japan began experiencing the wave of the coronavirus disease 2019 (COVID-19) pandemic, providing a unique opportunity to compare the incidence of acute respiratory infection (ARI) between the two disaster responses under distinct conditions.

Sources for Information: The data were collected by using the standard disaster medical reporting system used in Japan, so-called the Japan-Surveillance in Post-Extreme Emergencies and Disasters (J-SPEED), which reports number and types of patients treated by Emergency Medical Teams (EMTs). Data for ARI were extracted from daily aggregated data on the J-SPEED form and the frequency of ARI in two disasters was compared.

Observation: Acute respiratory infection in the West Japan heavy rain that occurred in the absence of COVID-19 and in the Kumamoto heavy rain that occurred in the presence of COVID-19 were responsible for 5.4% and 1.2% of the total consultation, respectively ($P < .001$).

Analysis of Observation and Conclusion: Between the occurrence of these two disasters, Japan implemented COVID-19 preventive measures on a personal and organizational level, such as wearing masks, disinfecting hands, maintaining social distance, improving room ventilation, and screening people who entered evacuation centers by using hygiene management checklists. By following the basic prevention measures stated above, ARI can be significantly reduced during a disaster.

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Keywords: acute respiratory infection; COVID-19; Emergency Medical Team; Emergency Medical Team minimum data set; J-SPEED

Abbreviations:
ARI: acute respiratory infection
COVID-19: coronavirus disease 2019
EMT: Emergency Medical Team
J-SPEED: Japan-Surveillance in Post-Extreme Emergencies and Disasters
WHO: World Health Organization

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Introduction

The rate of disaster has increased over the past several decades. Floods account for 40%-50% of all disasters and disaster-related deaths world-wide[1,2] and have widespread social and health impacts. Floods accounted for 14% of total disaster events in Japan from 1985 through 2018.[3] However, according to Japan's Meteorological Agency (Minato City, Tokyo, Japan), annual rainfall of 50mm per hour has increased 1.4-times in the last 30 years,[4] making emergency response a critical issue in the country.

Japan recently experienced two major heavy rain disasters: the West Japan heavy rain disaster in July 2018, which claimed 263 lives, left eight people missing, and injured 484 people;[5] and the Kumamoto heavy rain disaster in July 2020, which claimed 84 lives, left two people missing, and injured 80 people.[6] In terms of population density,[7–11] average temperature,[12] and humidity[13] in the rainiest month (July), these two locations are similar, though Kumamoto Prefecture had higher rainfall than West Japan in 2018[14] (Table 1). In the time between these two disasters, Japan began experiencing the first wave of the coronavirus disease 2019 (COVID-19) pandemic, providing a unique opportunity to compare the incidence of acute respiratory infection (ARI) between the two disaster responses in the presence of different pandemic and response conditions. Thus, the current study aims to describe the differences in the frequency of ARI in the 2018 West Japan heavy rain disaster in the absence of COVID-19 and the 2020 Kumamoto heavy rain event in the presence of COVID-19.

Sources for Information

Data Collection

The data were collected by using the standard medical reporting form and system used in Japan, so-called the Japan-Surveillance in Post-Extreme Emergencies and Disasters (J-SPEED).[15] Deployed Emergency Medical Teams (EMTs) used the J-SPEED form to report the number and types of patients treated on that day to the EMT Coordination Cell (EMTCC). The data for the West Japan heavy rain disaster were collected from July 8 – September 11, 2018 and the data for the Kumamoto heavy rain disaster were collected from July 5 – July 31, 2020.

Data Analysis

In the current study, ARI data from daily aggregated data on the J-SPEED form were extracted. Fischer test was used to see if there was a difference in the frequency of ARI in two hydrological disasters among people of all ages, children, adults, and the elderly. Microsoft Excel (Microsoft Corp.; Redmond, Washington USA) and STATA v15.1 (STATA Corp.; College Station, Texas USA) were used for analysis.

Ethical Review

Approval for ethical review was obtained from Hiroshima University (Hiroshima, Japan), 2020 (approval number: E-2059).

Observations

The two disasters currently being studied are both heavy rains followed by flooding, which are hydrological disasters. During the heavy rains of 2018 West Japan and 2020 Kumamoto, respectively, 85 and 80 EMTs provided medical consultation for 41 and 27 days, respectively, from July 8 through September 11, 2018 and July 5-31, 2020 (Table 1).

Table 2 depicts the frequency of ARI during the two disasters. A total of 3,620 consultations were conducted in the West Japan heavy rain, while 816 consultations were conducted within the period of the Kumamoto event. Acute respiratory infection in the West Japan and the Kumamoto disasters was responsible for 5.4% and 1.2% of the total consultations, respectively (P <.0001).

When compared to the Kumamoto heavy rain event (0.7%), the frequency of ARI in adults (15-64 years old) was significantly higher in the West Japan heavy rain (4.4%; P = .001). There was also a significant difference in the frequency of ARI in elders in the West Japan heavy rain event (6.0%) compared to the Kumamoto heavy rain event (0.6%; P <.0001). No significant difference was found in ARI frequency among children (P = .94).

	2018 West Japan	2020 Kumamoto
Population[a]	6,076,181	1,737,660
Population Density[a,b]	285.6	426.4
Temperature[c]	28.7°C	25.8°C
Humidity[c]	71%	85%
Rainfall[c]	433.2 mm	847.5 mm
Number of Dead[d] (per 100,000 persons)	263 (4.3)	84 (4.8)
Number of Missing[d] (per 100,000 persons)	8 (0.13)	2 (0.11)
Number of Injured[d] (per 100,000 persons)	484 (8.0)	80 (4.6)
Total Number Days for Observation[e]	41 days	27 days
Number of Teams Deployed[e]	85	80
Number of Daily Reports[e]	402	208
Number of Patient Consultations[e]	3620	816

Table 1. General Information of the Two Disasters
[a] Total population of Hiroshima, Okayama and Ehime Prefecture for 2018 West Japan; Kumamoto prefecture for 2020 Kumamoto.[7–14]
[b] Persons per square kilometer.
[c] Average of Hiroshima city (Hiroshima Prefecture), Okayama city (Okayama Prefecture), and Matsuyama city (Ehime Prefecture) for 2018 West Japan; Kumamoto city for 2020 Kumamoto.[7–14]
[d] Data from the Japan Meteorological Agency and the Fire and Disaster Management Agency reports.[5,6]
[e] Data from J-SPEED Daily Reports from Emergency Medical Teams.

Analysis of Observations

The current study found a significant decrease in the frequency in ARI in the Kumamoto heavy rain disaster compared to that of West Japan. The Kumamoto disaster occurred in July 2020, during which time Japan was experiencing the first wave of the COVID-19 pandemic. As a result, during this time period, Japan implemented COVID-19 preventive measures on a personal and organizational levels, such as wearing masks, disinfecting hands and surfaces, maintaining social distance, and improving room ventilation. Hygiene management checklists were used to control the

	2018 West Japan		2020 Kumamoto		
Age Category	N	%	N	%	P Value[a]
All Ages					
Total	3620		816		
ARI	195	5.4%	10	1.2%	<.001
0-14					
Total	156		41		
ARI	20	12.8%	5	12.2%	.94
15-64					
Total	2065		268		
ARI	91	4.4%	2	0.7%	.001
65+					
Total	1399		507		
ARI	84	6.0%	3	0.6%	<.001

Table 2. Incidence of ARI during the 2018 West Japan and 2020 Kumamoto Heavy Rain Disasters
Abbreviation: ARI, acute respiratory infection.
[a] Derived from Fischer test.

hygiene environment at the evacuation centers at Hitoyoshi Public Health Center in Kumamoto Prefecture, and a medical thermometer, acrylic panels, and hand sanitizers were placed at the reception desk to screen people who entered evacuation centers. Furthermore, the evacuation shelters were designed in such a way that social distance was maintained.[16] There were no confirmed cases of COVID-19 among evacuees. The significant difference in ARI incidence may have been reflected by COVID-19 prevention measures. It can also be stated that any type of ARI can be avoided by taking precautionary measures such as wearing masks and organizing evacuation centers in such a way that social distance is maintained during disasters. Children aged zero to 14 years old, on the other hand, showed no significant difference. It could be that children are less likely to follow preventive measures including wearing masks than adults and elders,[17] and that the mask was not as effective in children as in adults, which could be due to the fit of the masks on their smaller faces.[18] Furthermore, it is highly likely that children do not maintain a social distance when they are playing. The World Health Organization (WHO; Geneva, Switzerland) stated that children aged five years and under should not be required to wear masks. The WHO also advised that the decision to use masks for children aged six to 11 years should be based on the ability of a child to safely and appropriately use a mask and the infection situation in the area.[19] Effective preventive measures of ARI among children require further research.

Conclusion

A significant reduction in ARI was observed during heavy rain events that occurred in the presence of COVID-19 compared to those that occurred in the absence of COVID-19. Thus, preventive measures against COVID-19 can substantially reduce incidence of ARI during a disaster.

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