

A Memorandum Regarding the State of Support for Day Care Centers Following a Heavy Rainfall Disaster

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保育所への豪雨災害後の支援の在り方についての覚書

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1. Introduction

In September of 2019, Niimi City in Okayama Prefecture suffered heavy damage from torrential rainfalls. This disaster is officially known as the *Niimishi Reiwa Gannen Kugatsu Shuuchuu Gouu Saigai* (Niimi City Local Heavy Rainfall Disaster of September 2019). We have been providing disaster relief support and assisting with cleanup efforts of the contaminated mud in the city in order to prevent the spread of infection among local infants. Furthermore, in the hope that active efforts will be made at day care centers in the future to create effective infection control measures during and following times of flood damage, we have recorded our activities and observations in this paper.

When focusing on flood damage within research regarding disasters within the field of early childhood care and education, Murosaki et al. (1994) and Nakano et al. (2014) have written papers on the theme of examining how day care centers should be run during times of flooding.

Additionally, research has been carried out by Sekiyama (2013) regarding psychological analysis of children who have been affected by floods, and by Tamura (2019) regarding what education should be provided by day care centers in connection with rivers and floods. From an overall view of disasters, Shimizu et al. (2016) and Ogura et al. (2019) have analyzed disaster manuals at kindergartens and day care centers and conducted research on the theme of what kind of disaster response capabilities day care centers should have.

We want to focus here on how none of the research regarding day care center response to disasters up to this point has been conducted on measures implemented to control outbreaks of infections in instances of flood damage. Endo et al. (2018) point out that within the field of children's health, measures for prevention of both infections themselves and their spread are particularly important for teachers working at day care centers, during both everyday operations and times of

disaster. Additionally, in the field of disaster nursing, as Doi et al. (2011) explain, *Legionella pneumophila* becomes an aerosol following flooding and disperses in the air, infecting those who are weaker. As such, people who help with cleanup efforts after flooding, and people who continue to live in areas that have been affected by flooding are more easily infected. Therefore, it is common sense in modern society to come up with infection control measures after flood damage has occurred. On the other hand, it can be said that welfare facilities and specialized agencies that look after infants have placed little importance on control measures for infections that have a risk of occurring after flooding. For these reasons, we have written this paper in the hope that we can begin a discussion from the perspective of controlling infections about how, following flooding disasters, support should be provided to welfare facilities and specialized agencies that look after infants.

2. Circumstances of the Disaster

On the evening of September 3, 2019, Niimi City, Okayama Prefecture, was greatly damaged after it was hit by localized torrential rainfall of over 120 milliliters an hour. In various areas around Niimi City, landslides and overflow of waterways caused flood damage to around 300 houses. As Niimi City is geographically surrounded by mountains, water and soil from those mountains flowed into the central part of the city, leading to debris and contaminated mud piling up over a meter high in some houses. This is the *Niimishi Reiwa Gannen Kugatsu Shuuchuu Gouu Saigai* (Niimi City Local Heavy Rainfall Disaster of September 2019). Due to the localized nature of the heavy rains, it was not recognized as a large disaster, and national relief measures were inapplicable. This caused many city residents to feel very anxious and nervous about their situation¹⁾.

Day Care Center A, which cares for local infants, was heavily damaged by flood inundation 10 centimeters above floor level. Due to this damage, the day care center shut down the day after the disaster, and the nearly 200 infants that were being taken care of there had to be divided up between 11 other infant care facilities in Niimi City until it could reopen.

Every day after Day Care Center A was damaged, the staff of the day care and parents of the children going there worked tirelessly to scrape out the contaminated mud which had flowed inside the facility, disinfect the interior of day care center, and replace the sand in the play area. Thanks to their diligent efforts, the center was able to reopen and care for the infants enrolled there just one week later, on September 11, 2019. However, for the children, their parents, and the day care center staff, this was not the end of their nightmare. In fact, many ill effects of the disaster remained.

3. Outbreaks among the Day Care Center Infants and Possible Causes

From September 11 to September 17, 2019, we had the opportunity to hear from several parents of infants being cared for at Day Care Centers A and B. They said that their children had fevers, were vomiting, or suffering from diarrhea. Additionally, a parent whose child went to Day Care Center B mentioned that the month after the disaster, their child had had a fever for two days straight, so the mother and child went to a large hospital to have a pathogenic bacteria examination. The results were all negative, and the child quickly recovered, leaving the parent feeling relieved. We have learned, through various occasions, that one cause of fever symptoms in infants is by a pathogen, such as a virus or bacterium, entering the body²⁾. As a matter of fact, reports of *Legionella pneumonia* increased in Okayama Prefecture after the heavy

rain disaster of July 2018³⁾. After the flooding disaster in Niimi City, the weather was intensely hot for many days, leading to the contaminated mud drying up very rapidly. We suspected that there was a risk that some kind of harmful bacteria were contained within the mud, and it had become an aerosol and dispersed, infecting the children.

After that, we gathered information regarding relief efforts at Day Care Centers A and B led by Niimi City directly following the disaster. As a result, we were able to confirm that disinfection was thoroughly carried out in all the buildings at Day Care Center A and that the soil and sand had been replaced in the gardens and play area. Also, we were able to confirm that there was no flood damage at any of the buildings at Day Care Center B, and although some contaminated mud had flowed into the center grounds, a very thick layer of new soil had been spread above it, removing the possibility of any ill effects toward the children. In other words, we concluded that if the children were breathing in any kinds of harmful bacteria, there was a high possibility that it was happening outside of the day care center grounds. Many areas throughout Niimi City had suffered flood damage, and as such, even if the children were breathing in bacteria, there was no way to know exactly where. Therefore, we first investigated the areas around



Fig.1 The disaster-affected area next to Day Care Center A

Day Care Centers A and B. We found that, at Day Care Center A, contaminated mud had flowed into a waterway and passageway next to the center and dried, and the area had been left covered with contaminated soil and dust (Fig.1).

In addition, we found that the parking lot in front of Day Care Center B was still covered with contaminated sand (Fig.2). We assumed that the sand and soil around both day care centers contained bacteria, and it was possible that the children were breathing it in when it was blown into the air by the wind. Therefore, we set to work removing the accumulated mud, soils, and sand from the waterway and passageway next to Day Care Center A and the parking lot near Day Care Center B.



Fig.2 The disaster-affected area at Day Care Center B

4. Detailed Description of Relief Activities

First, we made a plan for which day care center to give priority to in our relief efforts to remove the contaminated mud and sand. The sand in the 500m² parking lot in front of Day Care Center B was extremely dry and loose, and blew easily in the wind. We determined that it required the most urgent action, so we decided to start our relief efforts there. The contaminated sand covered the entire surface of the parking lot, and in addition, contaminated mud 20cm deep had accumulated in

a side ditch next to it. So, we decided to first wash the sand in the parking lot into the ditch, and then remove the mud afterward.

During the removal process, there was a risk of relief workers breathing in contaminated sand and contracting pneumonia, so instead of general use surgical masks, all volunteer staff wore Type N95



Fig.3 Relief work done wearing Type N95 Particulate Respirator



Fig.4 Completion of relief work with the staff of Day Care Center B

Particulate Respirators, which do not allow dust or bacteria to pass through⁴⁾ (Fig.3).

Also, in order to prevent contaminated sand from blowing around during cleanup efforts and inconveniencing nearby residents, we made sure to first spray a small amount of water over the area to dampen the sand before removal. As electricity was unavailable in the parking lot, we could not use pressure washers, which made cleanup efforts difficult. With cooperation from Day Care Center B, we filled buckets with water from their faucets, washed the sand into the ditch, and finally, carefully scrubbed the surface with brushes to remove all the sand.

Cleanup there was completed after a total of eight cleanup activities were carried out in the month-and-a-half period from September 13 to October 28, 2019 (Fig.4). Cleanup activities totaled 42 hours, and there was a cumulative total of 34 volunteers. We transported a total of about 210 sandbags filled with contaminated sand and soil, with a total weight of about 3 tons, to the temporary storage site the city had set up.

Next, we carried out removal of the contaminated mud and sand in the waterway (1 m wide, 100m long) and the passageway (50cm wide, 60m long)



Fig.5 Relief Work at Day Care Center A

next to Day Care Center A. Contaminated mud 40cm deep had accumulated in the waterway, and 10cm of mud and sand had accumulated on the passageway. This was also outdoor work, which meant that electricity was unavailable for our pressure washers. Therefore, with the cooperation of Day Care Center A, we used water from their faucets to wash the contaminated mud and sand from the passageway into the waterway, after which we filled sandbags with the contaminated mud and transported them to a temporary storage site 500m away (Fig.5).

About a month after we had started relief work, we realized that there was contaminated mud that had piled up in Park C beside the waterway. Every time it rained, that mud would be washed into the waterway and passageway that we were working to clean up. When we inquired about it with the Construction Division at Niimi City Hall, we were told that as the park was held by the city, we could not conduct cleanup work there. Furthermore, the city responded that they would begin cleanup work there in three months and have the park available for children to use in April. However, unless that contaminated mud was removed, it would continue to flow into our cleanup area, making it impossible

for us to complete our work. It was particularly worrying because we suspected it would continue to have ill effects on the infants at Day Care Center A. On December 15, while we were working on cleaning up the area, a reporter from NHK Okayama came to cover our efforts, and we conveyed that we were troubled because the park was being left in its post-flood state. On the evening of December 23, NHK Okayama aired a special report about our work. This led to Niimi City speeding up their cleanup of the park, and on January 3, 2020, the park's cleanup was completed. Following this, no contaminated mud washed in the waterway and passageway we were working on, and cleanup work proceeded smoothly until we were able to remove all of the contaminated mud in the area (Fig.6). The relief work in the area next to Day Care Center A was conducted 7 times over a two-month period from December 1, 2019 to January 26, 2020. Cleanup activities totaled 52 hours, and there was a cumulative total of 68 volunteers. Compared with Day Care Center B, where we started our cleanup efforts, we had more volunteers participating. This was because we reported our cleanup activities daily on social media, and people who saw those posts decided that they wanted to participate in



Fig.6 Left: A passageway before cleanup work Right: After cleanup work

work that would protect children in the area and give their parents peace of mind. We carried a total of about 2100 sandbags filled with contaminated sand and soil, with a total weight of about 31 tons, to the temporary storage site nearby. This clearly illustrates how severe the damage was at Day Care Center A.

5. Conclusion

Following the completion of our cleanup activities, we received reports from both Day Care Centers A and B that it seemed that there were fewer children who were coming down with fevers that didn't seem to have a clear cause. However, we also were unable to find a scientific foundation that proved our cleanup activities had protected the children from bacteria and kept them from getting sick.

Day care centers protect the lives of the children going there every day. Their immunity is still in its early stages of development. Due to this, even if we were to request that the day care centers affected by the flooding allow us to conduct an empiric study because the contaminated sand might be harming the children there, the parents of those children might be concerned that the day care centers were operating in conditions that could be harmful to their children. Whether or not the centers themselves were favorably disposed to such a study, it could lead to confusion among parents and cause them to lose trust in the day care centers. In the first place, when doing disaster relief or recovery work, helping those who are suffering should be given first priority. To gather data for research while conducting relief work requires that a relationship of trust between the affected day care centers and us as the researchers providing support must first be built before conducting any kind of study. Also, that relationship of trust must also be built between

the researchers and the parents of the children who would be the focus of such a study. Even if we could have mechanically received permission for this kind of research, it deals with the sensitive subject of personal information of young children, and it is possible that the day care center staff and the parents might feel uncomfortable, annoyed, or even offended. We believed that leaving the affected areas as they were until a relationship of trust could be established that allowed us to collect research data was not beneficial for the children, their parents, or the day care centers. Therefore, we placed priority on the health of the children and sincerely focused on providing cleanup and relief support. It is for these reasons that we were unable to obtain objective numerical values this time.

However, while we were doing cleanup work on cold days, the heads of both Day Care Centers A and B brought us warm drinks, and some of the staff of both centers came and helped us on their days off. Parents of some of the children at the centers expressed their thanks when they came to pick up their children. Also, after all of the relief work had been completed, we received letters of thanks from the heads of both day care centers, as well as pictures that the children had drawn of us. In other words, you could say that in exchange for scientific numerical values necessary for research, we gained an intangible trust with the staff and parents at both day care centers. Although we hope that it does not happen, it is possible that Day Care Centers A and B may be affected by a disaster again. If that does occur, we have built a relationship of trust with the staff and parents, and it may be possible to obtain data concerning the children. We strive every day to become independent researchers, but we also hope, as educators at public universities, to be reliable people who can continue to contribute to the lives of the local residents of our areas.

Notes

- 1) Hayashi, N. (2019, September 16). Okayama • Niimishi shuuchuu gouu Kuni no shien seido ukerarezu fuan no koe. *Mainichi Shimbun*. Retrieved September 28, 2020, from <https://mainichi.jp/articles/20190916/k00/00m/040/027000c>
- 2) For example, the *Ho-mukea Shidou* (Homecare Guidance) of the Certified Nurse in Pediatric Emergency Nursing organization, when discussing fevers in infants, describes a fever as a kind of biological defensive reaction, a physical state, caused by various factors including disorders of the central regulation of body temperature or pyrogenic agents such as bacteria or viruses, where the temperature level is at a set point higher than normal and generation and diffusion of body temperature occurs. (Retrieved July 31, 2020, from <http://www.cn-pen.org/homecare/>)
- 3) Kutsuna, S. (2020, July 4). Ooamego no kansenshou, hinanjo de no sai no kansen yobou ni tsuite. Retrieved August 2, 2020, from <https://news.yahoo.co.jp/byline/kutsuna-satoshi/20200704-00186487/>
- 4) The Infectious Disease Surveillance Center, in its entry *Gareki tekkyo sagyoutou no sai no kansen yobou ni tsuite* (Regarding Prevention of Infection when Removing Debris), calls to attention the necessity of wearing masks when providing disaster relief support, requesting that people wear masks in such situations in order to prevent blown dust or splashed water (*Legionella pneumophila*) from directly entering one's mouth. In particular, Type N95 Particulate Respirators reduce the risk of respiratory system infection in people who wear them, and as such, are often used at disaster relief locations. (Retrieved August 1, 2020, from <https://idsc.niid.go.jp/>

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