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Ma. Regina Justina E. Estuar
Ateneo de Manila University

Nlandu Roger Ngatu

Sakiko Kanbara

John Owen Ilagan
Ateneo de Manila University

John Noel Victorino
Ateneo de Manila University

See next page for additional authors

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Authors

Ma. Regina Justina E. Estuar, Nlandu Roger Ngatu, Sakiko Kanbara, John Owen Ilagan, John Noel Victorino, Jhoanna Isla, Megumi Nishikawa, Miho Morosawa, Yoko Nakayama, and Sayumi Nojima

Rainstorm and Flood Disasters: Case study of Shelter Management by Manila Municipal DRR (Disaster Risk Reduction) Teams during Tropical Storm “Mario” (Fung Wong) in 2014

Nlandu Roger Ngatu¹, Justina Maria Regina-Estuar², Sakiko Kanbara¹, John Owen Ilagan², John Noel Victorino², Jhoanna Isla², Megumi Nishikawa¹, Miho Morosawa¹, Yoko Nakayama¹ and Sayumi Nojima¹

1. Graduate School of Health and Nursing Sciences, and DNGL (Disaster Nursing Global Leader) program, University of Kochi, Kochi 781-8515, Japan

2. Department of Information System and Computer Science, Ateneo De Manila University, Quezon 1108, Manila, Philippines

Abstract: Floods are the leading cause of natural disaster-related deaths worldwide. This study aimed at assessing disaster preparedness and response by local Barangay (municipal) DRR (disaster risk reduction) teams during the flooding caused by tropical storm Mario in Manila in 2014. A cross-sectional and descriptive study was conducted, consisting of interviews in which five shelter managers participated. In total, 325 evacuees were received in 4 evacuation centers, whereas the remaining shelter received 30 families housed in tents. Only 3 shelters (60%) had some food and non-food items available prior to the arrival of evacuees. WASH (Water, sanitation and hygiene) services were insufficient; latrines were available in 4 (80%) shelters, but no latrine was available for displaced people housed in tents. Only 3 (60%) shelters had toilets cleaned regularly. Detergents, toothbrushes and toothpastes were provided in 3 (60%) shelters, whereas only 2 (40%) had diapers for babies and none (0%) had hygienic period items for ladies. Food items were daily distributed in 3 (60%) shelters. Health services were not satisfactory, as medical consultations were organized but irregularly in 3 (60%) of the five shelters. Disaster preparedness and response in Barangay shelters were not satisfactory, suggesting the necessity for the central government to support local DRR volunteer teams. It is recommended to provide the volunteers with an inexpensive ICT (information and communications technology) tool to collect disaster preparedness data so that relief efforts will be more than sufficient at the time of disaster.

Key words: DRR (disaster risk reduction), disaster preparedness, disaster response, flood, rainstorm.

1. Introduction

Flooding is one of the major risks that increase in association with climate change, a phenomenon that intensifies the global water cycle [1]. The IPCC (Intergovernmental Panel on Climate Change) estimated that up to 20% of the world's population is likely to be affected by increased flood hazard by the year 2080 in the course of global warming [2]. Most studies that have made projections on climate change

impacts have suggested that the world will face an increase of the risk of floods due to warmer climate [3-5]. The global trend in natural disaster-related mortality shows that floods are the leading cause of natural disaster-related deaths worldwide, causing 6.8 million deaths in the 20th century. In 2012, they affected 72.7 million people in Asia, 15.6% of whom occurring in the Philippines [6, 7].

In the year 2010, there has been an average of 192 flood disasters a year that affected 189 million people [7]. Extreme weather and related consequences have become quite common in East-Asia, a region known

Corresponding author: Ngatu Roger Nlandu, Ph.D., specially appointed assistant professor, research field: global health and disaster risk management. E-mail: ngatu@dngl.u-kochi.ac.jp.

to be the most affected by natural disasters. Throughout the region, especially in countries such as Japan, China and the Philippines, devastating magnitudes of flood disasters have recently been taking place with high human and environmental impacts.

The Philippines are one of the most water-related disaster affected country. Recent history shows an increasing occurrence of typhoons including Typhoon Ketsana, also called Ondoy [8] in 2009 which was the first in many years that caused severe and prolonged flooding in the capital. In 2013, Haiyan-Yolanda, known as one of most powerful typhoons to have made landfall in recorded history, has swept a number of Filipino islands, causing flooding that killed about 7,300 people, destroyed houses, and made nearly 1,000,000 evacuees [9-11]. This study was conducted to assess the state of preparedness and shelter management by local municipal (barangay)-based DRR (disaster risk reduction) teams during tropical storm "Mario"-caused flooding in Manila in 2014.

2. Materials and Methods

2.1 Local Setting

The capital, Manila, is the second largest of the 16 cities in the Philippines; its population is estimated to be approximately 12 million (2010 census) for an area of 3,855 hectares, making Manila the most densely populated city in the world [12, 13]. The city is politically divided into barangays, the smallest unit of local government in the country, and each barangay has its own chairperson and councilors.

Manila is located in what is known as the "pacific typhoon belt", which makes it the second among the high risk capitals to live in, according to Swiss Re's report [14]. The city features tropical savanna climate. Its proximity to the equator means that temperature range is very small, rarely going below 20 degree Celsius or above 38 degree Celsius. The dry season goes from December through May, and the long rainy season covers the remaining period with warm temperatures. Typhoons often occur from June to

September and can cause flooding in parts of Manila. Recently though, low pressure areas that turn into tropical rain storms have been experienced.

2.2 Tropical Storm Mario in Metro-Manila, September 2014

Our Japanese-Filipino collaborative research group conducted a study to assess the state of flood disaster preparedness and disaster relief activities undertaken by local barangay (municipal) DRR teams during the tropical storm Mario (internationally known as Fung-Wong). The following activities were implemented in Dona Imelda and Santa Lucia barangays, Manila: meeting local barangay leaders and DRR teams, holding workshops with disaster responders to explain the study objectives, visiting evacuation centers (shelters) and testing the newly developed "emergency/disaster reporting application" by Manila-based co-researchers named eBayanihan, and the SHEREPO ("Shelter Reporting application") developed by the Japanese team. This work will culminate in the integration of the two systems.

On 19 September 2014, the tropical storm "Mario" that has been sweeping other Filipino provinces has reached Metro-Manila, causing inundation and flooding in most Manila cities. This extreme weather led to the closure of schools and government offices, forcing thousands of people to evacuate. Interviews were conducted in which representative shelter managers from barangay DRR teams participated. This was a cross-sectional and descriptive study in which participants had to answer an interview questionnaire on preparedness and relief activities carried out in evacuation centers. Visits to evacuation centers and affected areas were also conducted.

2.3 Participants and Interview Questionnaire

Phone calls were made to local Barangay (municipal) leaders to plan workshops and interviews with shelter managers. The workshop consisted of explanations on the collaborative research project and

demonstrations on practical use of the new mobile phone application for emergency and disaster shelter status reporting. In total, five Barangay leaders agreed to hold workshops and interviews at their respective headquarters. Of the workshop participants, five managers of barangay shelters who have been leading the disaster relief activities at evacuation centers took part in the interview. Local Filipino research members helped explain the questions in local dialect whenever it was necessary. The interview questionnaire was answered anonymously, and comprised 37 questions related to main disaster relief interventions: (1) WASH (Water, Sanitation, Hygiene); (2) Health services; (3) Food & Non-Food; (4) Protection/safety of evacuees at disaster settings.

2.4 Ethical Consideration and Statistical Analysis

Ethical approval was obtained from the departmental Research Ethics Committee, department of Information System and Computer Science, ADMU (Ateneo De Manila University), Philippines. For the description and interpretation of the interview results, data are expressed as proportions; the 5 interviewees were considered to represent their DRR teams. Considered as outcome variable, each of the main disaster relief interventions was dichotomized (Yes = 1; No = 0), with 1 representing 100% of coverage. Chi-square test was used to compare scores of the group of 5 interviewees to the expected result (100%). Stata software version 11 was used to perform the statistical analyses.

3. Results

3.1 Impact of the Flood and Disaster Preparedness in the Five Manila Barangays

According to the report from the Filipino NDRRMC (National Disaster Risk Reduction and Management Council), released on 23 September 2014, the storm affected 1,160,050 people, whereas a total of 129,676 people were evacuated in temporary shelters in Manila; 12 people died [15]. In all 5 shelters that participated in the study, the

identification and registration of displaced population were not undertaken, as interviewees mentioned only the number of persons or families received in their respective evacuation centers. As for the displaced population, four evacuation centers received a total of 325 people (141 males and 184 females), whereas the remaining shelter received 30 families housed in tents. Evacuation centers consisted of a government building, a school, a fire station, a church and tents.

Of the five shelters, only 3 (60%) evacuation centers had some food and non-food items available prior to the arrival of evacuees; however, the amount of food items and calories distributed to evacuees was unknown to the interviewees ($P < 0.05$).

3.2 Status of WASH (Water, Sanitation and Hygiene) Provision in Evacuation Centers

Good quality water is essential in a disaster relief response. Bottled drinking water was distributed once daily or every three days in evacuation centers, whereas tap water was used for laundry, shower, cooking and washing the dishes; however, the average amount provided to each evacuee or family was not recalled by the interviewees and water quality was not assessed. Latrines (toilets) were available but insufficient in 80% (4/5) of shelters (there were 2 to 4 toilets for shelters that sometimes receive more than 500-1,000 evacuees); only 60% (3/5) of shelters had toilets cleaned regularly (40% daily, 20% once/2days), whereas no latrine was available for evacuees housed in tents ($P < 0.05$) (Fig. 1).

On the other hand, detergent (soap), toothbrushes and toothpastes were provided in 3 (60%) shelters, whereas only 40% had diapers available for babies and none (0%) of the evacuation centers provided hygienic period items for ladies (Table 1).

3.3 Provision of Food and Non-Food Items in Evacuation Centers

As for water, food is an essential item in disaster relief interventions. Table 2 shows the status of food

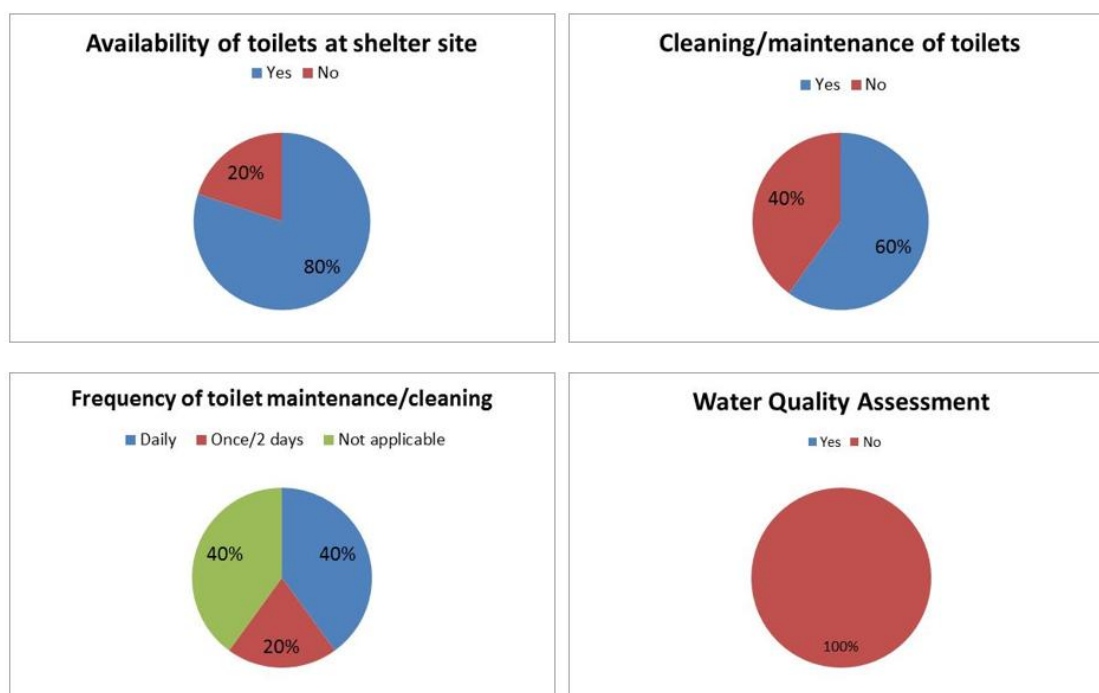


Fig. 1 WASH (Water, sanitation and hygiene) status in five participating shelters.

It shows that latrines (toilets) were available in 80% (4/5) of shelters, whereas one shelter (tents) had no toilet at all; latrine maintenance and cleaning was undertaken in 60% (3/5) of shelters. In addition, water quality assessment was not performed.

Table 1 Provision of hygiene items in five participating evacuation centers.

Provision of hygiene items	Evacuation center	
	Yes (%)	No (%)
Soap/detergent	3 (60)	2 (40)
Toothbrush & toothpaste	3 (60)	2 (40)
Diaper	2 (40)	3 (60)
Period items	0 (0)	5 (100)

Table 2 Provision of food and non-food items in five participating evacuation centers.

Relief items	Evacuation center	
	Yes (%)	No (%)
Food (daily distribution)	3 (60)	2 (40)
Clothing	3 (60)	2 (40)
Sleeping goods	-	-
Mat	2 (40)	3 (60)
Blanket	2 (40)	3 (60)
Nothing	1 (20)	4 (80)

and non-food items provision in the five evacuation centers. Food items (rice, noodles and canned sardines) were daily distributed in 3 (60 %) evacuation centers; however, they were distributed irregularly in the remaining 2 shelters ($P < 0.05$). The amount of food (in terms of quantity or calories) provided to each evacuee was not known to the shelter managers. Clothing was

provided in 3 (60%) evacuation centers, whereas mats and blankets were both distributed in 2 (40%) shelters. However, in one (20%) shelter, evacuees received neither mats nor blankets.

3.4 Provision of Health Services in Evacuation Centers

Of the 5 evacuation centers, medical consultations were organized in 3 (60%) shelters, whereas mental health or psychological support activities were implemented in none (0%) of them. In addition, only 1 interviewee reported respiratory complaints (cold, cough) as main health complaints in the shelter; the other 4 interviewees did not. Taken together, health services provision in shelters was not satisfactory ($P < 0.05$). Regarding the safety of evacuees in disasters settings, no GBV (gender-based violence) or other safety issue was reported in the five evacuation centers.

4. Discussion

The present work assessed the status of preparedness, disaster response and risk assessment in flood-affected Manila barangays during the “Mario”

storm in September 2014, which is considered as one of the strongest typhoons to occur after Haiyan-Yolanda, the most destructive and strongest tropical storm in history [16]. Five representative shelter managing staff from Dona Imelda and Santa Lucia barangay DRR teams answered the interview questionnaire. Results showed that, in general, preparedness was insufficient, as most basic relief activities did not meet internationally accepted minimum standards (Sphere project) and the majority of shelter managers (60%) reported unsatisfactory health services.

In a disaster setting, the registration and identification of affected people represents one of the important activities of disaster management. Records of displaced persons or refugees' characteristics such as gender, age, address, educational background, as well as their occupational history and/or skills are very useful, not only for an efficient management of human resources at disaster settings, but also contributes to ensuring the safety and life support of affected communities. It also helps to organize local community disaster relief groups. In the five participating shelters, such identification process was not performed.

General sanitation and personal hygiene were not sufficient in all shelters. For example, the provision of WASH services in evacuation centers managed by the interviewees was not satisfactory. One shelter had no toilet at all, whereas those where toilets were available, the number was not enough. A school building that often receives some hundreds or thousands of evacuees had only 2 latrines available for evacuees; the remaining 2 latrines were reserved for school staff. In addition, there were evacuation centers where soap or detergents were not distributed and latrines not cleaned on a daily basis, which presents a real threat due to the risk of water or food-borne infectious diseases. Furthermore, in evacuation centers, water quality assessment was not performed, suggesting that shelter managers may have assumed that bottled water

might be safe. Given the relatively low quality of hygiene and sanitation in disaster settings compared to the normal situation, it is advised that the source and quality of drinking water be known and the quality of water checked periodically.

On the other hand, the absence of period items for ladies among relief goods distributed in evacuation centers might suggest that such items have not yet been included in the list of relief items to be provided to disaster victims. In emergency settings, given the unpredictability of the occurrence of water-related diseases and their severity, as well as the uncertainty of their duration, displaced persons may have to stay longer in shelters than expected. That may increase their needs and women, in particular, should be supported in regard to their basic personal hygiene.

Food is one of the basic needs to be provided to evacuees. In shelters managed by our interviewees, food items were daily distributed; however, the amount of food or calories given to each evacuee was not known, making it unclear whether they met the acceptable minimum standard. Another noticeable fact was that no interpersonal conflict, violent incident or other safety issue was reported, suggesting that life was relatively safe during the short stay of evacuees in shelters.

4.1 Factors Contributing to Inundation and Flooding

During our visits to affected areas, we also interviewed local residents to find out the reason why flooding often occurs during heavy rains and why most victims living in houses scattered along the riversides often refuse to evacuate. It was observed that small houses with 2 to 3 floors are being built along the riverside, while the concrete fences that should serve as barrier between residences and the river have been destroyed by water currents, exposing the residents to hazardous extreme weather (Fig. 2A). In case of inundation (Fig. 2B), riverside residents prefer to use the second or third floor of their houses as shelters, until the situation gets worse for them to seek



Fig. 2 View of houses and broken concrete fence at riverside (A), inundated street (B) and workshops (C, D) in Quezon city, Manila. (source: one of authors; 21 September 2014).

help. In addition, many other residents hesitate to evacuate because local officials ask them to relocate and refrain from returning to their homes in the aftermath of a flood disaster.

On the other hand, the drainage system in the city does not function well, making water drainage difficult. This causes inundation of streets, even main roads, with an impact on the traffic, leading to offices and schools' shut down.

Nevertheless, results from the present fieldwork concern only 5 shelters of 2 of numerous barangays and may not reflect the status of disaster preparedness and shelter management in all Manila barangays, given differences in terms of economic status and level of urbanization of cities and barangays. In addition, the workshops organized in collaboration with local barangay staff (Fig. 2 C-D) might not be sufficient and there is a need for more training for capacity building to establish an efficient shelter management system in municipalities.

5. Conclusion

The present study evaluated the status of water

disaster preparedness and response of municipal DRR teams in Manila during the tropical storm Mario-related flooding in 2014. Findings suggest that the capacity of local DRR teams to respond to flood disaster, as well as the shelter management in participating evacuation centers was limited. This report highlights the fact that basic relief services provided were not satisfactory. In order to reduce the adverse human impact of the disaster in times of emergency events such as rainstorm and flooding, the provision of food, safe water as well as acceptable hygiene and sanitation conditions should be not only made available and accessible to the affected population, but also meet their needs; thus, providing a relief assistance following internationally recommended minimum standards is advisable. Obviously, local barangay disaster relief groups might have been responding to flood disaster using the available relief items and equipments to assist people in needs. Increasing their capacity to respond to disasters, setting up inter-agency collaboration platforms, with the active participation of the central government, may contribute to improving the current

status of disaster preparedness and risk reduction in Manila barangays. It is recommended to provide volunteers with an inexpensive ICT tool to collect disaster preparedness data so that shelter and relief efforts will be more than sufficient at the time of disaster.

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