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A Preliminary Survey on Drinking Water Availability during 2017 - Flash Floods in Diyagama, Kalutara District of Sri Lanka

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1 INTRODUCTION

Sri Lanka being a tropical country, the magnitudes of rainfall vary from less than 900 mm on the southeast coast to 5000 mm on the western slopes of the highlands.The rainfall pattern is influenced by the monsoon winds of the Indian Ocean and the Bay of Bengal and is marked by four seasons (DMC - Disaster Management Centre, 2014). The incidences of flooding seem to be more frequent in the districts of Kalutara, Ratnapura, Gampaha, Ampara and Jaffna due to intense rainfalls experienced recently (DMC, 2009). The last South-west monsoon was activated on 24th May 2017 and 12-hours of heavy rains fell on Namunuthanna (619mm), Bulathsinghela (419mm), Morawaka (406mm) and Walasmulla (437mm) leading to riverine floods of the Kalu, Nilwala and Gin rivers. As a result of this, sudden flash flood occurred within a very short period, more than 465,000 individuals were affected, 20,792 houses were impacted and over 250 deaths were reported (DMC, 2017). Rural water supplies such as shallow and deep surface wells, hand pump operated deep tube wells and their support structures were totally or partially destroyed due to this flooding. As a result, 12,180 drinking water resources were affected along the Kalu, Nilwala and Gin river basins (DMC, 2017). During the post flood recovery assessments, the damages were measured in physical terms for which the monetary repair or replacements are to be estimated later (DMC, 2017). In such circumstances, these water sources were most probably contaminated with faecal coliforms (FC) and by various pathogenic bacteria which are harmful to human health (Sirajul Islam *et al.*, 2007). As per the reports of WHO 2004, water-related diseases continue to be one of the major health problems globally and 2.2 million cases of waterborne diarrhoea deaths were reported to be responsible for 3.7 % of total deaths. Thus, contaminated water can be a mode of transmission of pathogens via washing utensils, raw-consumed vegetables etc. (Sirajul Islam *et al*., 2007). In comparison with ground water reservoirs, surface water bodies are more vulnerable to faecal contamination due to the absence of natural soil protection and filtration (Kistemann*et al*., 2002). During heavy rainfalls, the microbial load in running water may suddenly increase substantially and reach water bodies very quickly (Kistemann*et al*., 2002). At present, there is no proper mechanism available to maintain the drinking water requirement during a flood in the study area. This preliminary survey examines the ability to supply the drinking water requirements of flood-affected people during and after the flash floods in the

village Diyagama, Kalutara district of Sri Lanka.

2 METHODOLOGY

2.1 Description of the Study Area

Diyagama is located in the Kalutara District closer to the northern bank of Kalu River (Figure 1) {GPS range-(6.630229, 79.995441),(6.636069, 80.009668)}.This is an economically impoverished, (mean income 25,471 Rupees.) densely populated area (991 individuals) with unplanned housing and inadequate water and sanitation facilities. Households at the banks of the Kalu River were visited and data on drinking water were systemically gathered. According to the census and statistics, 2012 there are 92 protected wells outside the premises, 145 unprotected wells, 5 tap lines inside and outside the premises, 15 rural water projects and 11 bowsers to supply water to this area (www.statistics.gov.lk).

Figure 1: A map of sampling sites in the study area

2.2 Data Collection and Statistical Analysis

This study was based on a questionnaire survey conducted with a total sample size of 40 households which were distributed randomly in the Diyagama area. The main variables included were the distance from natural water source (Kalu River) to home, the source of water used for drinking purpose, the amount of water used for drinking and other purposes, time-period of the disruption of routine life due to floods, water treatment before drinking, whether water source if affected or not, time taken for water source restoration, the institutions who provided the flood relieve, the type of flood relief received during the flash flood and the awareness about the disaster management programs etc. A questionnaire comprised 21 items related to the fulfilment of water requirement during and after the flood. The results were analysed by the SPSS 16.0 statistical software (α=0.05) and the association between the distance from the water source to the home and the effect from flood was tested with Kendall's tau-b test.

3 RESULTS AND DISCUSSION

3.1 The distance from the water source to the home

All the respondents lived within the range of 500m distance from the Kalu River, 60 % of them lived in the 50 m distance and rest lived in the 100m and 300 m distance as indicated in Figure 2a. Therefore, they are at a high risk of facing a flood in the future as well. The p value obtained was 0.047 as indicated in the table 1. Therefore, there is a negative relationship between the distance from the water source to the home and the effect from the flood.

3.2 The type of water source used

Majority of the respondents (55%) used their well to fulfil their water requirement (Figure 2b). Only 15 % consumed water supplied by the National Water Supply and Drainage Board. During the flash flood 80 % of the wells were affected and hence the villagers had difficulties in getting portable water during the flood. Furthermore, only 55 % of respondents boiled the water before drinking and the remnant therefore, has a huge possibility of getting infections through water contamination.

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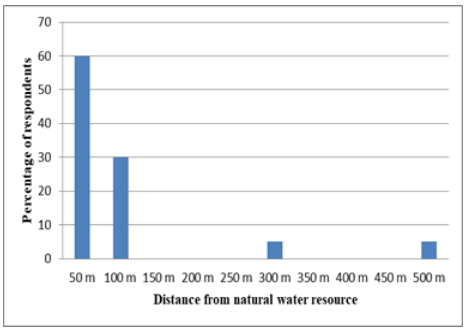

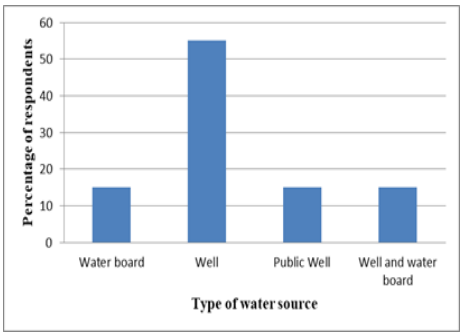

Figure 2a. The distance from the natural water resource to home, **2b**. The type of water source used for drinking purposes by the respondents

Table 1. The significant association between the distance from the water source to the home and the effect from the flood

	Value	Asymp. Std.Error[a]	Approx. T[b]	Approx. Sig.
Ordinal by Ordinal Kendall's tau-b	-.376	.162	-1.983	0.047

a. Not assuming the null hypothesis
b. Using the asymptotic standard error assuming the null hypothesis

3.3 The type of flood relief received by the affected people

Nearly 41 % of flood relief was received in the form of dried food items, only 20 % received bottled water (Figure 4). The average daily drinking water consumption of these respondents was 6.23 litres and the average days taken for restoration of water resources was 6.73. The average water requirement until the restoration was 41.25 litres. Only 5.50 litres of water were received during this time as flood relief. Therefore, the villagers had to face drinking water shortages during and after the flood.

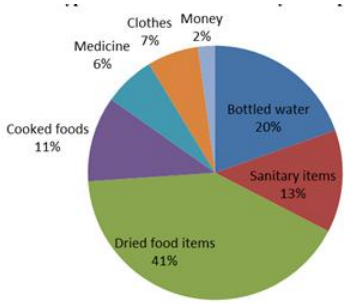

Figure 4: The type of water resources used by the respondents

3.4 Cleaning and testing of drinking water sources

90% of the flood affected wells were cleaned by the voluntary organizations and the government. But the quality of the water was not tested for microbial and other possible contaminations prior to drinking by the villagers.

3.5 The awareness of the disaster management program

Results of the survey recognized that, only 23 % of the respondents were aware of the post-disaster management procedures. Hence, this study highlights the requirement of implementing effective awareness programs on natural disaster management for people in possible affected areas.

4 CONCLUSIONS

Villagers of Diyagama identified the shortage of water during the recent flash flood as the major problem. Even though they received flood relief, the supply of

drinking water was lower than the actual requirement. On the other hand, to obtain floods relief in the affected areas took some time. Regarding the purifying of the drinking water sources, mainly wells, the respondents were satisfied. But they had some doubts whether it had been done properly. Further studies are needed to assess the sources of contamination, quality of the water sources in that flood affected areas. Relevant government officials or any other responsible parties have not visited the area for water sample collection for microbial analysis such as *E-coli* which is necessary before they start drinking water from the wells and other water sources.

5 RECOMMENDATIONS

There should be a quick mechanism to supply drinking water continuously during such situations. Pipe borne water from the National Water Supply and Drainage Board does not seem sufficient and it is recommended that it is extended further in the affected areas. Immediate action should be taken to clean the drinking water sources and ensure the water quality through proper testing methods. Public awareness of the potential danger of consuming contaminated water, in-house treatment procedures and techniques are recommended.

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