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Sub-theme: Water and Society

Safe water in flooded areas with low-cost water filters
an experience with Siphon filters after the floods in Malawi.

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Disaster, Flooding, Household water treatment, Low-cost water filter, Malawi, Safe drinking water.

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Introduction and context

On 16th January 2015 the Southern districts of Malawi and neighbouring districts in Mozambique were struck by flooding, as a result of days of excessive rainfall. Over 230.000 people were displaced and more than 270 people were killed by the floods. The displaced people have been housed in a number of temporary camps, where access to water and sanitation have proven to be difficult due to shortage of clean water sources and the temporal nature of the camps. As a result there has been an outbreak of Cholera in one of the camps in February 2015, with over 50 cases of Cholera.

As a way to increase the access to safe and clean water in the camps, 460 low-cost Tulip Siphon Filters have been distributed in the Osiyana camp in Nsanje District, as a joint cooperation between Marion Medical Mission and the SMART Centre Mzuzu of the Development Department of the Church of Central Africa (CCAP) Synod of Livingstonia, providing an estimated 4000 people with clean and safe water. To learn from the intervention and the distribution, the filters have been monitored and evaluated in follow-up visits and a

Masters of Public Health student from Emory University's Rollins School of Public Health has carried out an evaluation of the user compliance of the filters in this context (Fagerli, 2015). These activities have provided valuable insights in the most effective strategy for the distribution and use of these filters in emergency situations and the potential for future use of these filters.

Household Water Treatment and the Tulip Filter

Household Water Treatment (or HWTS) refers to the treatment of water at the Point of Use (PoU), as an alternative to treatment of the water at the source. With HWTS, each household has its own means of water treatment. Examples of treatment systems are using additives such as chloride, filtration and techniques such as the Lifestraw or Waterguard. The advantage of HWTS over treatment at the source is that harmful effects of the contamination on the path from the source to the Point of Use are prevented.

One of the technologies promoted as a low-cost HWTS is the Tulip Siphon Filter produced by the company Basic Water Needs. The Tulip Filter consists of a element made of diatomatious earth and siphon hose produced in India and two locally produced buckets with a tap. Tests have shown that the filter takes out all turbidity and more than 99,99% of the bacteria and it is available in Malawi for a price of $16 - $18 (this includes the buckets, which cost about $2 each). As part of the response to the floods of January, 460 filters, including 2 buckets for each filter, have been distributed to households in affected communities.

Results

In June 2015 an evaluation of the results of the distribution has taken place during which 101 households were interviewed on their experiences with the Tulip Siphon Filter. A full paper on this research titled *'An Evaluation of User Compliance and Perceptions of Tulip Filters in Response to the 2015 Malawi Flood'* is forthcoming (Fagerli, 2015). The main aim of the study was to assess the suitability of the Tulip Siphon Filter for use in emergency situations.

The study by Fagerli showed that 65% of the households who had received a filter used the filter at least once a week. Their main incentive to use the filter was that it made the water safer to drink and that they believed it prevented diseases. About 10% of the households had completely stopped using the filter. The main reason for stopping using the filter or for using the filter less was the presence of a solar powered chlorination plant, which had recently been installed by an NGO, and which, especially just after it had been installed, had led to confusion among some of the households on which method to use.

When the households were asked what their favourite method of treatment was, 88% responded with the Tulip Siphon Filter and 11% found chlorination the most convenient method. The main reason to prefer the Tulip Siphon Filter was the absence of smell or taste and the ease of use. A complaint of 11% of the households on the filter was the low yield, which is likely due to lack of maintenance or incorrect use of the filter.

Regarding the effect of the use of HWTS on the health of members of the households, only 4% of the interviewed persons experienced frequent diarrhoea after they started using HWTS as compared to 73% experiencing frequent diarrhoea before the distribution of HWTS.

In this specific situation the filters were distributed to the communities free of charge, but when the households were asked on their willingness to pay for the filter, all of the regular users replied they were willing to pay for a replacement or for new filter (cost between $10 and $12 for the filter, this excludes the buckets).

Conclusion

The results of the study show that the communities accept the Tulip filter as a suitable water treatment option. A main reason to accept the Tulip Filter is the absence of smell or taste, quite a number of users even used the Tulip filter to filter the chlorinated water, mainly to get rid of the chlorine taste and smell resulting from the process chlorination. For the specific case of the distribution of filters after an emergency situation, the study shows that the Tulip filter is a suitable option which can potentially decrease the cost of these interventions due to the low-cost nature of the filter.

The approach adopted for the distribution which consisted of the distribution and the implementation of trainings to the communities on the use and maintenance of the filter has paid off. This is shown by the high usage of the filter, even after 4 months, and the ease of use which is mentioned by the majority of the households which is both a result of the design of the filter as well as the efforts put into training and follow-up. A factor contributing to the success of the distribution was the presence of infrastructure (such as local chiefs) and transport possibilities (such as helicopters) which were used to ensure the most needy communities were reached.

Another conclusion that can be drawn, based on this research, is that despite receiving the filter free of charge, the households have taken ownership of the filter. This is supported by the relative high use of the filter and the few situations where there was a breakage in the filter and households have repaired their filter on their own, without the help of others.

Besides providing the communities with clean and safe water, a secondary aim of the distribution was to assess the viability of the Tulip Siphon Filters for use in an emergency situation as well as using the emergency situation as a way to kick-start the adoption of the filter and the local market for the filter. The study has shown the users are in general satisfied with the filter, the future will have to show whether the exercise has sped-up the adoption of the filter outside the context of an emergency.

Discussion

A development that complicated both the research and the adoption of the filters was the fact that an NGO installed a solar pump with a chlorination plant within the target community.

This plant has led to a lot of confusion among the communities as they were told to use the water from plant instead of the filters. But when the capacity of the plant proved to be insufficient to supply the whole community, most people returned to the filter but used open sources such as the river or open wells instead of the water from borehole which they used before but which was now connected to the solar plant.
A lesson that can be drawn is that coordination is needed between the actors involved in these emergency situations to prevent confusion among the end-users. A positive side effect however of the high number of organisations involved in providing clean water after an emergency is that users are aware of the importance of clean and safe water and they are offered a range of options to choose from (some had 3 or more options offered to them). This enables them to choose the method that best suits them, instead of having to abide with only one option in which will likely not be their preferred option.

A lesson drawn from the use of the Tulip Siphon Filter is that it is essential to have a supply chain of spare parts in place. Some parts of the filter can break after (incorrect) use and can easily be replaced or repaired when the parts are available. But when the parts are not available, the filter might be abandoned and the household returns to the old, unsafe, situation. Also, to prevent the return to the old situation, repeated training and maintenance is essential to make sure families understand how the filter works and the importance of using clean and safe water.

Regarding the cost, although all the users answered they would buy a (replacement) filter in time, it will be interesting to find out whether in the long term they will have the needed amount ready and if so, whether they are willing to spend it on the filter, despite the clear advantages they have seen. A possible way to overcome this is to offer the filter at a reduced price or to offer the potential customers an option to buy the filter on a loan basis, but the most healthy and desirable situation would be a situation where users are able to pay the full price for the product, which stresses the need for low-cost HWTS-products.

Simple usage and storage of the filtered water reported more adherence to use water treatment than the use of additives and while additives are easier to introduce use on the short term just after the emergency has taken place, a filter will lead to a more long term improvement of the health situation.

Using the filters in an emergency setting can potentially open a market for this or other Household Water Treatment options. The emergency situation creates a large market at once and enables to introduce the options on a larger scale. This also enables the start of a supply chain of filters and spare parts, which is needed for sustainable and long term use of filters, although continual follow-up and the establishment of a supply network will be needed to encourage this to take place; it is unlikely this will happen on its own.

Illustrations of the distribution of the filters to flood victims

Overview of the area where the flooding took place

The flooding has affected the infrastructure in the area.

Unloading the filters from the helicopters

Loading the buckets and filter into the helicopter used to transport the filters to the distribution area.

Distribution of the filters by Marion Medical Mission and SMART Centre staff.

Distribution of the filters by Marion Medical Mission and SMART Centre staff.

Illustrations of the distribution of the filters to flood victims (cont'd)

A technician from the SMART Centre training on the use of the Tulip Filter

Beneficiaries during a training on the use of the filter

Beneficiaries practicing the use of the filter during the training

The use of the Tulip Siphon filter by one of the households

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