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Title:

Household water filters for emergencies
An experience with Siphon filters after the floods in Malawi. .

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Abstract/Summary

Key words:
Emergency, Flooding, Household water treatment, Low-cost water filter, Malawi, Safe drinking water.

Southern districts of Malawi and Mozambique were struck by flooding in January 2015. Over 230.000 people were dislaced and more than 270 people were killed by the floods. The displaced people were housed in temporary camps, where access to safe water and sanitation was limited. As a result there was an outbreak of Cholera in one of the camps in February 2015, with over 50 cases of Cholera. To treat water from unsafe sources 460 Siphon Filters were distributed in the Osiyana camp by Marion Medical Mission and the SMART (Simple, Market-based, Affordable, Repairable Technologies) Centre in Malawi. This SMART Centre is hosted by the Development Department of the Church of Central Africa (CCAP) Synod of Livingstonia.
The filters provided some 4000 people with clean and safe water. To learn from the intervention, the filters have been monitored 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. (Fagerli, 2015). This has provided valuable insights in strategies for the distribution of these filters in emergency situations and the potential for future use of these filters.

Introduction

Household Water Treatment and Storage (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 treatment option. Examples of HWTS options are additives such as chlorine, and household filters with membranes such as the Lifestraw Family and the Sawyer filter or with candle element table top filters like Korean king or Tulip filters. The advantage of PoU treatment over treatment at the source is that there less risk of recontamination during transport or storage.
The water filters promoted by the CCAP SMART Centre include Sawyer filters and Tulip Siphon and Table Top filters which are produced by the company Basic Water Needs. The Tulip Siphon Filter consists of a filter element of diatomatious earth impreganted with Colloidal silver, a siphon hose and a backwash bulb. It this case two locally produced plastic containers with a tap were included. Laboratory tests in many countries (Malawi, Netherlands, India, etc.) indicate that this filter removes all turbidity and over 99,99% of all harmfull bacteria. The cost are of around $12 for the filter (contaners and a tap cost an extra $6). As part of the response to the floods of January, 460 filters have been distributed.

Description of the Case Study – Approach or technology

In June 2015 an evaluation of the distribution took place and 101 households were interviewed on their experiences with the Siphon Filter. The full paper on this research is titled *'An Evaluation of User Compliance and Perceptions of Tulip Filters in Response to the 2015 Malawi Flood'* (Fagerli, 2015). The aim of the study was to assess the suitability of the Tulip Siphon Filter for use in emergency situations. The study showed that 65% of the households used the filter at least once a week. Their main incentive to use the filter was that it made the water cleaner and safe 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 or for using the filter less was the presence of a solar powered pump and chlorination plant, installed by an NGO, which led to confusion among some of the households on which method to use. When the households were asked about their favourite type of treatment, 88% responded with the Siphon Filter and 11% found chlorination the most convenient method. The main reason to prefer the 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 personsreported 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 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 around $12 for the filter, excluding the buckets). Besides providing safe water, a second aim of the distribution was to assess the viability of the 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 potential market for the filter.

	
Distribution of filters	Filter entrepreneur trained by the CCAP SMART Centre explaining the use and maintenance of the filter

Main results and lessons learnt

The study shows that the communities accept the filter as a suitable water treatment option. A main reason is the absence of smell or taste, quite a number of users even used the filter to remove the chlorine taste resulting from the chlorination plant. For the distribution of filters after an emergency situation, the study shows that because of its high filter volume, the siphon filter is a suitable option which can potentially decrease the cost of interventions for safe waer due to the low-cost of this filter model.
The approach of the distribution and the implementation of trainings to the communities on the use and maintenance of the filter has been effective. 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.
Both the research and the adoption of the filters was complicated by the fact that an NGO installed a solar pump with a chlorination plant which led to a lot of confusion among the families as they were told to use the water from this plant instead of using 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 with the solar pump.
Despite receiving the filter free of charge, the households have taken ownership of the filter. This is supported by the relativly high use of the filter and by the few situations where there was a breakage in the filter and households have reassembled 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 that 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.
A lesson drawn from the Siphon filters is that it is essential to have a supply chain of spare parts in place. Parts of the filter can break after (incorrect) use and when parts are not available, the filter might be abandoned and the household returns to the old, unsafe, situation. Also, 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 they are willing to spend money. A possible way to overcome this is to offer the replacement filter

at a reduced price or to be able to buy the replacement filter on a loan basis or to be able to pay over time. The most desirable situation would be that users are willing to pay the full price. It will be good to study the effect of providing opportunities of making payments over time might to to increase the sustainability of the use of the filter or other types of HWTS.

Simple usage and storage of the filtered water reported more adherence 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 filters in emergencies can potentially open a market for HWTS. The emergency situation creates a large critical mass and enables a large scale. This may enable the start of a supply chain of filters and spare parts, which is needed for sustainable and long term use of filters. 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.

Distribution of filters

Filters being used

Conclusions and Recommendations

1. A reason for the success of the filters was the presence of local chiefs and transport such as helicopters, to ensure the most needy communities were reached.
2. Despite receiving the filter free of charge, the households used the filters and took ownership
3. There was a relatively high use of the filter and some households repaired their system after breakage
4. 4% of the interviewed persons reported frequent diarrhoea after using HWTS as compared to a reported 73% experiencing frequent diarrhoea before the distribution of HWTS.
5. The confusion after the installation of a borehole and chlorination plan indicates the need for coordination between Aid organisations.
6. A positive side effect of providing HWTS options in emergencies is that families become more aware of unsafe water and the importance of water treatment
7. When filters are distributed it is essential to have a supply chain of spare parts in place.
8. 88% of the families responding in the study preferred the Siphon Filter and 11% found chlorination the most convenient method.
9. There was a high usage of the filter, 4 months after its dissemination
10. Almost all users said they would buy a (replacement) filter, but payment optison are needed since most families are very poor.
11. As for useage, there was more adherence of the filters than of the use of Chlorine.
12. The study shows that because of its high filter capacity a siphon filter is a suitable option for emergencies.
13. Using the filters in an emergency can open a market for filters and can result in a start of a supply chain of filters and spare parts, which is essential for a sustainability.
14. It is important that families have options to choose from
15. Since Siphon filters and its backwashing system are relatively complicated, good and repeated training is needed to make sure families understand the maintenance.
16. Low cost and effective Household water filters are an important tool to reduce water borne diseases but NGO funded support for awareness and creating a critical mass is needed to scale up the use of filters since it is unlikely this will happen on its own.

References

Fagerli 2015 "'An Evaluation of User Compliance and Perceptions of Tulip Filters in Response to the 2015 Malawi Flood'

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