37th WEDC International Conference, Hanoi, Vietnam, 2014

SUSTAINABLE WATER AND SANITATION SERVICES
FOR ALL IN A FAST CHANGING WORLD

The effects of using P&G Purifier of Water during the treatment of severe acute malnutrition

S. Pietzsch, F. Gressard, N. Radin, C. Guyot-Bender & N. Villeminot

BRIEFING PAPER 1884

Facilitated in Bandundu, D.R.C over a span of 4 months, this study evaluated the efficacy of P&G Purifier of Water, a point-of-use water treatment product produced and provided by Procter & Gamble. The evaluation was conducted by comparing the efficiency of using Ready-to-use-Food (RUTF) and treating domestic water with P&G Purifier of Water versus RUTF alone in the nutrition treatment of severe acute malnutrition (SAM) children under the age of 5 years without medical complications. Two hypotheses were tested: 1.) SAM cases without medical complication benefiting from RUTF + P&G Purifier of Water have a lower prevalence of waterborne diseases during the course of their treatment 2.) SAM children benefiting from RUTF + P&G Purifier of Water have better outcomes in terms of treatment time (shorter) and weight gain (higher). Ultimately, the study determined the importance of promoting P&G Purifier of Water as part of the standard nutrition treatment of SAM children without medical complications, in areas with difficult or no access to clean drinking water.

Context of study

Geography and demography
Bandundu province is situated in the west of the Democratic Republic of Congo (DRC). Although there is little armed conflict, the province has suffered significant socio-economic slowdown since the 1980s highly affecting the local population. The lack of public services and the linked rural exodus have led to areas being particularly vulnerable to malnutrition. The Health Zone of Popokabaka, located 400km from Kinshasa is one of these areas with a population of 168,546 people. The target population of this study (children between 6 - 59 months) was estimated at 28,652 (17% of the total population) (National Census, 1984).

Nutrition and sanitary conditions
The Health Zone of Popokabaka is comprised of one general referral hospital, 25 Health Centres, and 23 clinics. Identified undernourished children are referred to one of the 11 special treatment health centres which include 10 Outpatient Therapeutic Programs (OTP) and one stabilization centre (SC) for cases with medical complications. All are implemented through the MoH structure with support from ACF. The support provided includes nutritional treatment for Severe Acute Malnutrition (SAM) cases that are available as part of the Health Centre's basic routine activities.

In terms of sanitary conditions, there is a limited supply of safe drinking water in the district, where just one water source is set up within the Health Zone but it is not yet connected to the town's water supply system. The local people therefore must collect water from unprotected sources, like rivers, streams, rainwater collection systems, etc. This lack of access to safe drinking water is a cause for waterborne diseases affecting the local population.

Hygiene practices and sanitation facilities also remain poor where 34% of the population generally defecate out in the open. Since local village level cleanliness and sanitation is limited, in 2012 UNICEF along with the Health District began a campaign to sanitise villages and schools. By 2013, 20 villages were already covered.

Due to the above, the most frequent medical problems encountered by children under five years of age in this zone are malaria and intestinal parasites. Table 1 shows MoH statistics, and provides more details on the case load reported between December 2012 and Feb 2013.

Table 1. Disease caseload of children < 5 years old (Dec 2012 – Feb 2013, MoH Health Zone Statistics)		
Diseases	**# of cases**	**%**
Malaria	316	41%
Intestinal parasites	160	21%
Acute respiratory infection	83	11%
Diarrhoea	67	9%
Others	137	18%
TOTAL	**763**	**100%**

Study model and hypotheses

Objective
This general objective of the study was to evaluate the efficacy of P&G Purifier of Water, a point-of-use water treatment product. The study compared the efficiency of using Ready-to-use-Food (RUTF) and treating domestic water with P&G Purifier of Water versus RUTF alone, without any water treatment, in the nutrition treatment of severe acute malnourished (SAM) children under the age of 5 years without medical complications.

Hypotheses
Previous to the study, two hypotheses were developed and justified:
1. **SAM cases without medical complications consuming RUTF and water purified with P&G Purifier of Water have a lower prevalence of waterborne diseases during the course of their treatment.** Populations living in the intervention area use water collected from unprotected rivers, wells and other water points, which expose them to waterborne diseases such as diarrhoea, intestinal worms, dysentery, typhoid or cholera. The population and children in particular, are thus more prone to be affected by waterborne diseases. As such, the integration of P&G Purifier of Water into the standard treatment would reduce or prevent the occurrence of these diseases thanks to the purification of water used for domestic consumption by the household, and in particular the SAM patient.
2. **SAM children consuming RUTF and water purified with P&G Purifier of Water have better outcomes in terms of treatment time (shorter) and weight gain (higher).** There will be an absence or reduction of occurrence of waterborne diseases due to the treatment of SAM children with RUTF + P&G Purifier of Water. Consequently, this will shorten the length of stay in the OTPs and increase their daily weight gain (given that the length of stay is a denominator while computing the weight gain).

Methodology
The study was rolled out in seven health centers, divided into two groups: in the South for the control group, and in the East for the intervention group. The study data collection began on December 2012 and ended in March 2013.

The study used the regular nutrition protocol follow-up systems to gather data from the children included in the study. At the weekly Nutrition centre sessions, care takers were asked about the occurrence of any clinical symptoms since the last visit, anthropometric measurements of the child were taken (weight-for-height and Mid-Upper Arm Circumference, see note at end of paper), and the child underwent a complete physical examination.

At the household level, every two weeks a questionnaire was facilitated to collect data on dietary consumption, hygiene practices and (for the intervention group) the use of P&G Purifier of Water. A second visit was conducted to ensure the proper application of RUTF and P&G Purifier of Water.

Target population
A total of 207 children were enrolled in the trial, of these 105 were in the intervention group and 102 in the control group. Upon admission, the two groups were statistically similar with respect to age, sex and breastfeeding status. The intervention group had a slightly worse nutritional status with respect to Weight-for-Height (WFH) z-score (-3.15 intervention vs. -2.93 control, p=0.02), but had larger Mid-Upper Arm Circumferences (MUAC, 116.5mm vs. 114.2mm) (children with WFH z-score > -2 met the MUAC inclusion criteria). Details are provided in Table 2.

With respect to household characteristics, children in the intervention group came from smaller households with an average size of 6.0 members, as compared to 7.0 in the control group (p<0.001). Children in the intervention group were also from households with lower levels of parental education: 16.2% of the intervention group had parents that had completed secondary schooling compared to 31.4% of the control group (p=0.04).

Analysis and results
Significant differences were observed between the two groups with respect to the water sources used. The majority of households in the intervention group (67%) relied on unprotected springs as a water source, whereas control households primarily relied on other surface water (88%). Water quality testing found an average residual chlorine level of 0.26-0.34 in intervention households. Based on the findings, there is a strong acceptance of the intervention group, with 95% - 100% of usage.

Children in the intervention group had a significantly shorter mean length of stay as compared to children in the control group (26.4 days vs. 30.4 days, p=0.06). Average daily weight gain was also higher among the intervention group than in the control group, at 7.3g/kg/day and 6.6g/kg/day respectively, however this difference was not statistically significant (p=0.13) (see Table 2). Based on these results, utilising P&G Purifier of Water in addition to RUTF generally increased the health of the children.

With a decrease of 4 days in the average treatment time (see Figure 1), the average cost of the intervention group using P&G Purifier of Water for 26.4 days, amounted to a total of 36.96USD per child and treatment (31.68USD for RUTF and 5.28USD for P&G Purifier of Water). The cost of 4 days of RUTF is calculated at 4.8USD. With a cost of 5.28USD for the P&G Purifier of Water per treatment course of 26.4 days, this indicates that the reduction of 4 days treatment time would be able to cover 90.90% of the supplementary cost. Beyond benefiting the children's health, these results show that P&G Purifier of Water would not affect cost of aid significantly.

Table 2. Feeding program effectiveness by comparison group								
Indicator	**Standard**	**Intervention (n=105)**			**Control (n=102)**			**p-value***
		Median	Mean	Range	Median	Mean	Range	
Weight-for-Height z-score at entry	≤ -3	-3.24	-3.15 (0.61)	(-4.64,-0.74)	-3.03	-2.93 (0.66)	(-5.23, -0.81)	0.02
Weight-for-Height z-score at exit	≥ -2	-1.45	-1.31 (0.75)	(-2.15, 2.56)	-1.37	-1.21 (0.81)	(-2.10, 1.83)	0.36
Length of stay	<30 days	21	26.4 (12.3)	(7.77)	21	30.4 (17.7)	(7.97)	0.06
Weight gain	g/kg/day	6.7	7.3 (3.2)	(2.0, 17.9)	6.0	6.6 (3.6)	(1.3, 23.0)	0.13
*t-test								

Figure 1 presents frequency distributions for the length of stay by comparison group and illustrates differing distributions between the two comparison groups. The distribution of the intervention group is narrower and less skewed, with fewer children having extended lengths of stay as compared to the control group.
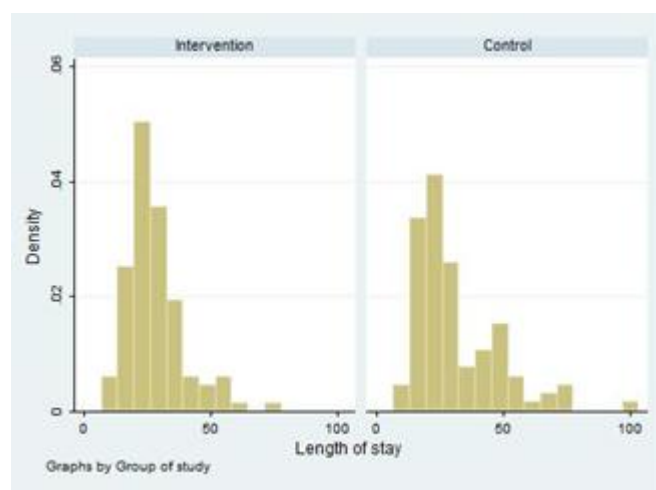

Figure 1. Length of stay by comparison group

Lessons learnt

While the study showed significant results towards the reduction of average length of stay, additional studies to improve results validity need to be facilitated:

- Further studies should have larger sample sizes and should be conducted in areas with high levels of untreated drinking water;
- Further studies should be applied in contexts with longer average nutrition treatment time;
- Further studies should reduce the data collection to avoid data-overload; and
- Further studies should include additional alternative intervention options to improve water quality and household water chain management through e.g. local water treatment products, water storage containers.

References

ACF INTERNATIONAL 2012 *The Essential –The key to understand Nutrition and Health and ACF position*. Action Contre la Faim: Paris, France

YOUNG, Helen and JASPARS, Susanne 2005 *The meaning and measurement of acute malnutrition in emergencies – a primer for decision-makers*. Network Paper Number 56. Humanitarian Practice Network, Overseas Development Institute: London, UK.

Notes

- P&G Purifier of Water is a powdered mixture that removes pathogenic microorganisms and suspended matter, making previously contaminated water clean, through a double action of flocculation-sedimentation and chlorine disinfection. It was formerly known as PUR.
- Weight-for-Height z-score is a widely used nutritional or anthropometric index, and is the best indicator of Severe Acute Malnutrition. Z-scores are the equivalent of standard deviations in a normal bell-shaped distribution curve. The normal range for growth is assumed to lie between –2 and +2 standard deviations, which include 95% of the reference population.
- The measurement of Mid-Upper Arm Circumference (MUAC) relies on the fact that it changes little between one and 5 years old. It is used in addition to WFH and is useful for the nutritional screening of children aged between one and five years for possible, as it requires little equipment and training and screening teams can cover a large number of children quickly. A MUAC below 115mm is considered an indicator of SAM for children under 5 years old.

Contact details

Silke Pietzsch
Action Against Hunger
247 W 37th Street
10th Floor
(212) 967-7800
spietzsh@actionagainsthunger.org
http://www.actionagainsthunger.org/

Nicolas Villeminot
Action Against Hunger
247 W 37th Street
10th Floor
(212) 967-7800
nvilleminot@actionagainsthunger.org
http://www.actionagainsthunger.org/