Reducing Diarrhoea with SODIS and Promoting Hygiene in Ng'ombe Slum, Zambia

The positive health effects in the Ng'ombe slum in Lusaka can be attributed to the consumption of safe water. A health impact survey reveals that irregular and regular SODIS use reduces diarrhoea incidence among children below five by 59.4 and 54.0 %, respectively compared to the control group. Users with a high consumption of treated water also exhibit improved hygiene behaviour. Trained households, which did not apply SODIS, more often used other household water treatment methods and had 12.7 % less diarrhoea than untrained households. Aleksandra Gara[1], Monika Tobler[2], Regula Meierhofer[2]

Introduction

SODIS – a simple disinfection method of microbiologically contaminated drinking water (www.sodis.ch) – has been promoted by Sandec for more than 10 years in areas where people have no access to safe drinking water. Currently, about 4.5 million people in over 30 countries use SODIS for treating their drinking water.

SODIS promotion in Zambia started in August 2008 in collaboration with the local NGO Keepers Zambia Foundation (KZF). The local Health Coordinating Committee (HCC) was entrusted with the fieldwork in Lusaka's slum Ng'ombe – an unplanned settlement of more than 90 000 inhabitants and very poor water and sanitation infrastructure.

Prior to introducing SODIS, the HCC conducted water, sanitation and hygiene promotion activities in Ng'ombe using boiling and chlorination as water treatment methods. Since November 2008, the Ministry of Health has been distributing free chlorine to all members of the community via the local health centre. However, users often abandoned chlorination when free distribution of the product was discontinued. The local HCC thus perceived the need to introduce SODIS as a further household water treatment option.

Promotion approach

SODIS was first implemented and promoted in Ng'ombe from August 2008 to July 2009. Three technical staff from KZF, two executive members of HCC and 60 promoters selected from the community were initially trained in SODIS and hygiene promotion. This group then went on to train, through group trainings and monthly household visits by promoters, 1600 households in water treatment with a special focus on SODIS and hygiene. Drama and role-play were additional tools used

together with distribution of stickers and posters. Fieldwork was supplemented by a national awareness raising campaign on TV and radio.

A survey, conducted in Ng'ombe between October and December 2009, assessed the level of behavioural change among the community trained during the first phase of the project. It also evaluated the health impact on people consuming treated water and on non-users. Aleksandra Gara, a student of the London School of Hygiene and Tropical Medicine, supervised data collection in Ng'ombe. The five interviewers of the study were students of the University of Zambia who had not been previously involved in the project.

Materials and methods
Sample selection

Households with children below five years of age were randomly selected to obtain a representative sample of 1600 trained households. 300 of the 543 households with children below five and reported as SODIS users by June 2009 were selected from a lottery box. 150 control households were chosen by random route sampling (every 5th household on the transect route) from old Ng'ombe, an area that had not been subjected to any promotional activities.

Questionnaire

The survey questionnaire addressed general demographic issues, illnesses of all children under five, uncooked food and all liquids consumed by the children under five, as well as water treatment, hygiene and sanitation practices of the households, SODIS use in the households along with general observations of the households and surroundings. Questions related to SODIS were asked at the end of the questionnaire to discourage respondents
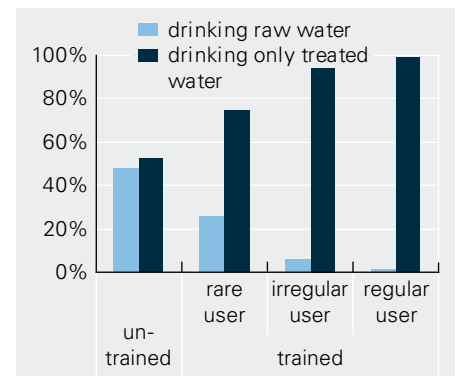

Figure 1: Percentage of children from trained and untrained households drinking raw water or only safe water (N=690).
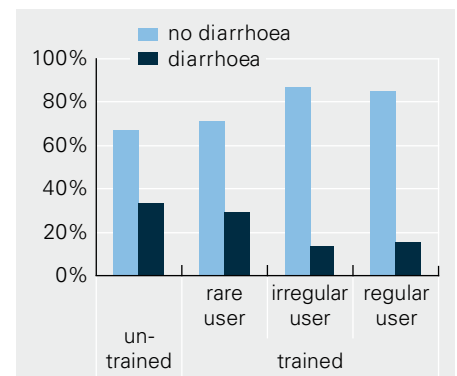

Figure 2: Percentage of children from trained and untrained households with diarrhoea (N=690).
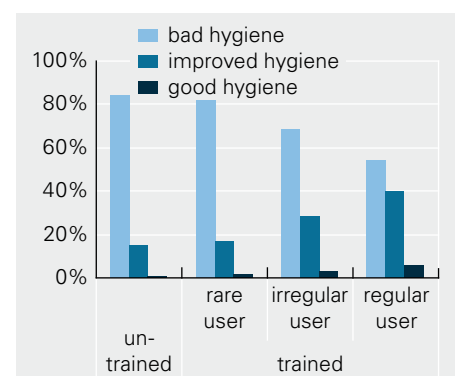

Figure 3: Percentage of trained and untrained households with bad, improved or good hygiene practices (N=458).

from giving biased answers to the initial questions on health and risk factors.

Data analysis

Epi-Data 3.1 was used for data entry, and the entered data was subsequently analysed by Excel and SPSS 17.0. Based on the variables collected, the following three indexes were established: a SODIS user index, a hygiene index and an economic index.

The SODIS user index grouped all households into rare, irregular or good users. The index is based on frequency of SODIS practice reported and assessed by the interviewers, ability of the respondents to explain SODIS, last SODIS application by the household, and number of bottles per person in the household.

The hygiene index classified all households according to their excellent, good or poor hygiene practices. This index is based on the intervals adults and children washed their hands, if the household consumed only treated water, on observed cleanliness of the household and surrounding area, and on frequency and manner of hand washing.

The economic index classified all households into wealthy, middle class or low class. The index was based on the number of electronic equipment, stove or fridge owned by the household, type of materials used to build the house and floor, fuel used to cook food, if the household numbered more or less than 2.5 persons per room, number of daily meals consumed by the household, source of water used, frequency of fruit or vegetables consumed, type of household toilet used, and the interviewers' welfare rating of the household.

Results

A total of 460 households were interviewed between 6 and 16 October 2009. Of the 460 households, 299 had been trained in SODIS use since August 2008; the remaining 161 households had no SODIS training (controls). The survey collected data on 716 children.

A greater number of trained households seemed to belong to the higher and middle class, and more untrained households to the lower class (P-value = 0.031). However, the economic index did not reveal a statistically significant difference between trained and untrained households (P-value = 0.114).

SODIS practice and safe water consumption in Ng'ombe

SODIS application at community level was assessed by the SODIS application index dividing households into untrained and trained, which were further subdivided into three groups, including rare, irregular and good users. Among the trained households, 39.4 % use SODIS regularly (16.7 %) or irregularly (22.4 %), while 60.8 % are rare users. SODIS users and non-user complement their HWT practice with other treatment methods (boiling and chlorination. 94 % of the children from households classified as irregular SODIS users consumed only safe water compared to 99 % of the children from households classified as good SODIS users (Fig. 1).

Illness and risk factors

Illness level among the surveyed children was divided into heavy, light, no diarrhoea but ill, and not ill. A child was classified as having diarrhoea if it meets the WHO criteria for diarrhoea with three or more loose stools within the last 24hrs during the last two weeks prior to being interviewed. Diarrhoea was classified as heavy if the child was reported ill for three days or more, and light if diarrhoea lasted two days or less. If the child did not meet the criteria for diarrhoea but presented one or more of the following symptoms: stomach pain, vomiting, no appetite and fever, it was classified as non-diarrhoeal.

Prevalence of diarrhoea (heavy and light) amongst children below five of the untrained households totalled 33 %, while 29 % diarrhoea prevalence was detected among children below five in the group of rare users (12.7 % less diarrhoea cases than in untrained households), 13 % in the group of irregular users (59.4 % less diarrhoea cases than in untrained households) and 15 % in the group of good users (54.0 % less diarrhoea cases than in untrained households) (Fig. 2).

Prevalence of illnesses other than diarrhoea (stomach pain, vomiting, no appetite, and fever) amongst children under five from untrained households totalled 8.0 %, while 13.0 % of the children in the rare users group were found to be ill, i. e. 9.6 % in the irregular users group and 5.6 % in the regular users group. The fact that there is no difference (p = 0.138) between non-diarrhoeal illness amongst users and non-users corroborates the assumption that the reported difference in diarrhoea cases between users and non-users is not likely to be attributed to systematic error or reporting bias.

A direct comparison between children consuming only safe water and those still consuming raw water throughout the groups reveals that the children drinking only safe water have 33.2 % less diarrhoea than those consuming raw water (p = 0.002).

Hygiene practice

Hygiene levels differed strongly between the groups with high levels of safe water consumption (regular and irregular users), the rare users and the untrained households (Fig. 3). Users with a high consumption of treated water also revealed a better hygiene behaviour: 28 % of irregular users showed improved hygiene practices and 3 % good hygiene practices, while 40 % of regular users revealed improved hygiene practices and 6 % good hygiene practices.

The hygiene behaviour of untrained households and the group of rare users did not greatly differ, i. e. 15 % of untrained households showed improved hygiene behaviour and 0.6 % good hygiene behaviour, while 17 % of the rare users revealed an improved hygiene behaviour and 1.7 % good hygiene practices.

When comparing diarrhoea with the hygiene index, an important difference can be noted between households with good hygiene behaviour and those with poor hygiene practices. Those with poor hygiene practices revealed a greater incidence of heavy diarrhoea.

Conclusions

This study concludes that consistent consumption of only treated water and improved hygiene practice are closely related to a decrease in diarrhoeal illness.

Regular SODIS users are characterised by an increased intake of safe drinks and better hygiene behaviour. Yet, the question whether the training approach used led to an increase in drinking water treatment and better hygiene or if individuals already exhibiting improved hygiene are more likely to implement the method or a combination of both remains to be determined.

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