Journal of Sustainable Development; Vol. 16, No. 2; 2023
ISSN 1913-9063 E-ISSN 1913-9071
Published by Canadian Center of Science and Education

Community-Led Total Sanitation: Conceptual Approach to Intestinal Parasites Control in Rural Areas, Côte d'Ivoire

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Received: January 6, 2023 Accepted: March 11, 2023 Online Published: March 18, 2023

doi:10.5539/jsd.v16n2p108 URL: https://doi.org/10.5539/jsd.v16n2p108

Abstract

Lack of appropriate sanitation, with poor hygiene and unsafe water, are sources of the spread of diseases. Ongoing efforts to control neglected tropical diseases, including helminth and intestinal protozoan infections, must be maintained and strengthened with new approaches. The aim of this study was to test the adherence of communities to the Community-Led Total Sanitation (CLTS) approach. The study was conducted in three (3) departments in south- central Côte d'Ivoire. In practice, the process of implementing CLTS involves 5 major steps: i) Mapping of defecation areas, ii) Calculating of human fecal matter quantity and medical costs, iii) Walk of shame, iv) Analysis of contamination pathways, v) Community decision making and latrine construction. Overall, latrine coverage and usage rates have increased considerably in the intervention localities. In particular, out of the 26 localities where the CLTS was applied, 11 reached a latrine coverage rate higher than 80%, 6 of which reached a 100% coverage rate. The results of this work should be used to raise awareness in rural communities about the importance of building and using latrines. Furthermore, CLTS implemented on a large scale can contribute to achieving Goal 3 and 6 of the Sustainable Development Goals (SDGs).

Keywords: Community-Led Total Sanitation, parasitic diseases, Sustainability, Sub-Saharan Africa

1. Introduction

The global strategy for helminthiasis control is preventive chemotherapy through regular administration of deworming drugs to populations at risk in a vertical approach. Albendazole or mebendazole against soil-transmitted helminthiasis and praziquantel against schistosomiasis are the current drugs of choice in preventive chemotherapy control (Crompton & WHO 2006). However, preventive chemotherapy does not protect patients from reinfections (Jia, Melville, Utzinger, King, & Zhou, 2012). Ongoing efforts to control neglected tropical diseases, including helminth and intestinal protozoan infections, must be maintained and strengthened with new approaches (Ross et al., 2017; Utzinger et al., 2009). In addition, integrated approaches hold promise for improving the cost effectiveness of interventions and thus ensuring the sustainability of control activities in resource-constrained countries (Raso et al., 2018).

Despite progress on Sustainable Development Goal (SDG) 6, 494 million people still practise open defecation worldwide, particularly in Africa (WHO & UNICEF 2021). Census data from the Taabo Health and Demographic Surveillance Site (HDSS) in south-central Côte d'Ivoire revealed that over 70% of households do not have latrines (Koné et al., 2015; Schmidlin et al., 2013). Furthermore, it is recognised that open defecation is a major source of transmission of schistosomes, soil-transmitted helminths and intestinal protozoa to people in this part of Côte d'Ivoire (Coulibaly et al., 2018; Hürlimann et al., 2018; Schmidlin et al., 2013).

There is a rich body of evidence that much of the global burden of disease is attributable to inadequate sanitation, poor water quality and poor hygiene (Mara, Lane, Scott, & Trouba, 2010) and that improved sanitation and water supply are key factors for sustainable control and prevention of helminthiasis and diarrhoea. However, current control efforts seem not to take these aspects sufficiently into account. To end open defecation in our communities in a sustainable way, Community Led Total Sanitation (CLTS) would be an efficient tool. The aim of this paper is to present mainly the process and data of the CLTS and to highlight the acceptance of this new approach by the communities.

2. Methodology

2.1 Cluster Randomised Trial

A cluster-randomized trial was conducted in the Taabo Health and Demographic Surveillance System (HDSS) and surrounding villages in the tip of the "V Baoulé" in south-central Côte d'Ivoire. Fifty-four (54) communities were randomly assigned to four intervention groups that received separate interventions as follows (Figure 1):

- *Group 1 (14 localities) - Preventive Chemotherapy (PC);*
- *Group 2 (13 localities) - PC + Community Led Total Sanitation (CLTS);*
- *Group 3 (14 localities) - PC + Community Health Education Programme (CHEP);*
- *Group 4 (13 localities) - PC + CLTS + CHEP*

First, a cross-sectional baseline survey (parasitological and sociological) was conducted prior to the implementation of interventions in 54 communities. Thereafter, the interventions were implemented in the 4 intervention groups as described above (Figure 1). Once in place, two follow-up surveys were conducted at 17 and 21 months intervals after the baseline survey, respectively.

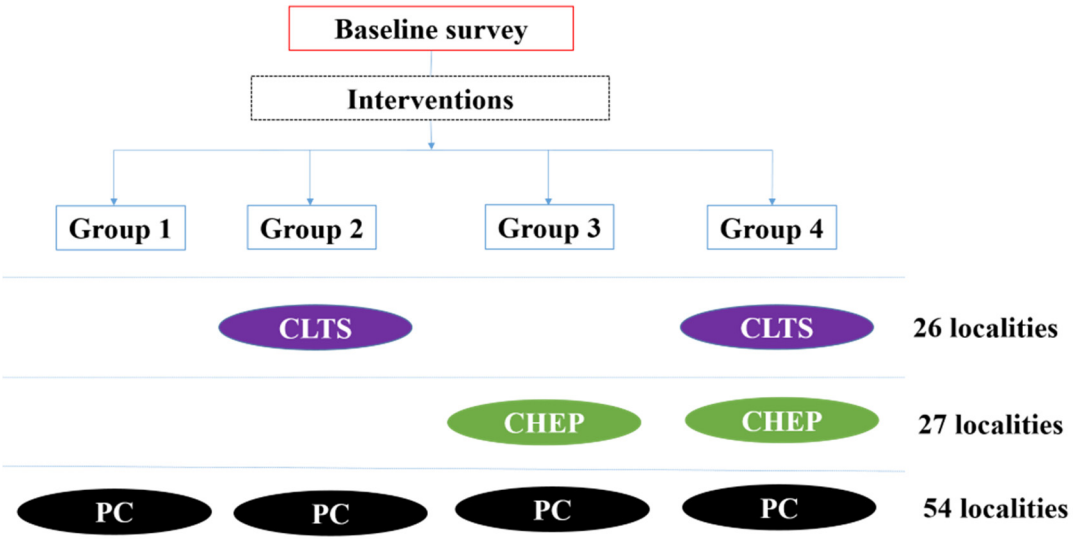

Figure 1. Experimental design of cluster randomised trials

2.2 Implementation of Interventions

The interventions were implemented immediately after the baseline survey. They began with the implementation of the CLTS intervention in 26 communities (intervention groups 2 and 4). Once these communities started constructing latrines, CHEP intervention was carried out in the remaining 27 communities (intervention group 3 and 4). Finally, once the latrines were constructed and the open defecation status of the communities assessed, and the CHEP administered, preventive chemotherapy through mass administration of deworming drugs was conducted in all four groups (Figure 2).

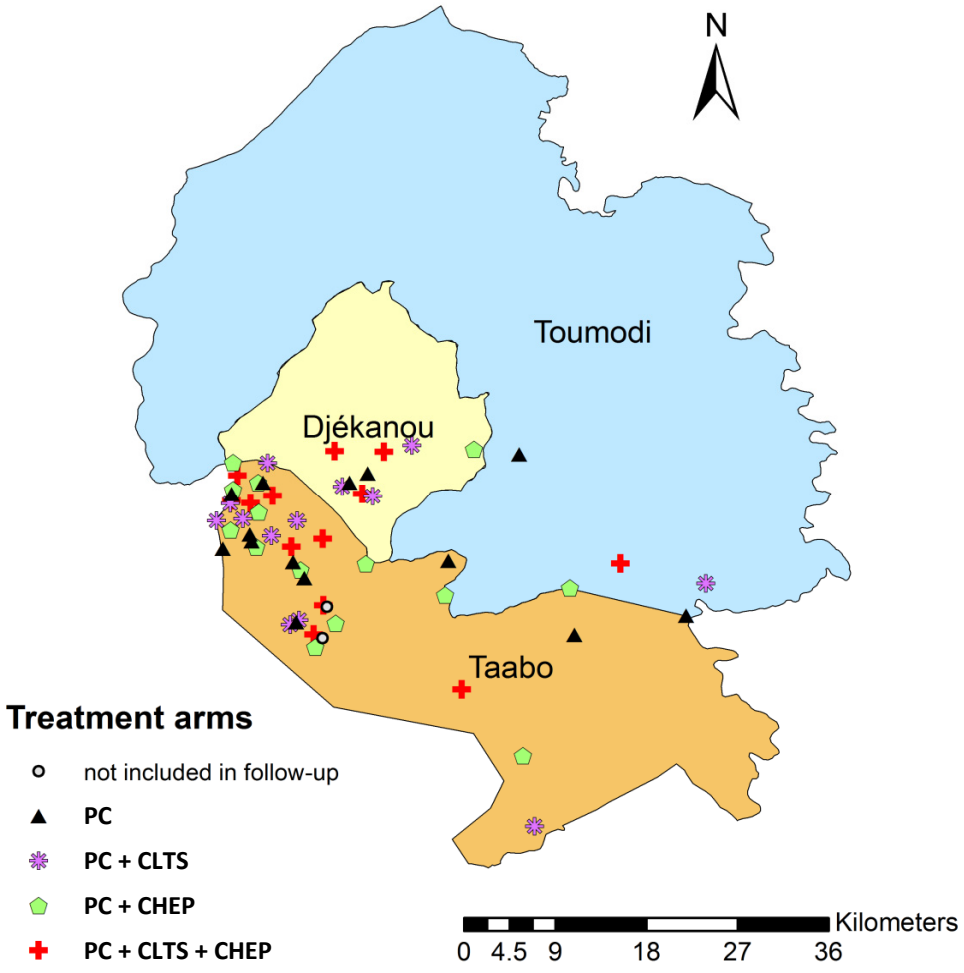

Figure 2. Distribution of the different localities by intervention arm

2.2.1 Community Led Total Sanitation

In practice, the process of CLTS implementation consists of 5 major steps:

i) Mapping of defecation areas

It consists of representing on the ground (members of the community) the village showing the landmarks (village limits, roads, school, health centre, water point, cemetery etc.) and the places of open defecation (Figure 3).

ii) Calculating of human fecal matter quantity and medical costs

It involves the community to calculate for themselves the fecal matter quantity produced by the village in a year. In addition, it takes them to calculate the medical expenses incurred by the village per year for diseases related to fecal contamination (diseases to be identified with the population) (Figure 4).

iii) Walk of shame

It allows the community to discover the unsanitary state of their village and to feel shame and disgust for practicing open defecation (Figure 5).

iv) Analysis of contamination pathways

It allows the community to observe how the flies transport the exposed stool outside to food and water (Figure 6).

v) Community decision making and latrine construction

It consists of synthesising lessons learned and getting the community to commit to ending open defecation immediately by constructing latrines (Figure 7).

Figure 3. Cartography of defecation area

Figure 4. Calculating of human fecal matter quantity

Figure 5. Walk of shame through defecation places in the community

Figure 6. Demonstration of contamination stool-food / stool-water

Figure 7. Community decision making and the construction of latrines

2.2.2 Community Health Education Programme

When communities were well advanced in the construction of latrines, they received health education sessions. The key messages delivered were essentially and fundamentally about hygiene and health for the community.

2.2.3 Preventive Chemotherapy

All members of the 54 communities received albendazole and praziquantel against soil-transmitted helminths and schistosomiasis, respectively.

3. Results and Discussion

3.1 Results

3.1.1 Demographic, Socio-Economic Characteristics and Water Sanitation and Hygiene (WASH) Indicators of Households during the Baseline Survey

Table 1 describes the socio-demographic and economic characteristics and WASH indicators of households during baseline surveys, and by intervention arm. Across all intervention arms, more than 40% of households had between 6 and 10 people. The average number of inhabitants per household was between 9 and 10.

In terms of household occupations, over 90% of households were primarily involved in agriculture. Less poor households represented less than 25% of the households interviewed.

Except for intervention arm 1 where 18.6% of households were observed to have piped water (tap water), drinking water coverage rates were below 5% in the other intervention arms.

The proportions of latrines and their usage rates were: i) arm 1 (20.1%, 16.4%); arm 2 (14.9%, 14.2%); iii) arm 3 (27.2%, 26.2%); iv) arm 4 (21.5%, 18.3%). Open defecation was widely reported (>70%) in all intervention arms. Only less than 20% of the households in the different arms were not defecating in the plantations during this assessment.

3.1.2 Latrine Coverage Rate in the Different Localities according to the Intervention Arms

Figure 8 shows the latrine coverage rates for the different localities from the baseline to the follow-up survey, according to the intervention arms. The colours represent the different intervention arms. i) orange: arm 1 (PC); ii) blue: arm 2 (PC+CLTS); iii) pink: arm 3 (PC+CHEP); iv) purple: arm 4 (PC+ CLTS+CHEP). The areas of the

circles are proportional to the sample sizes (localities, households, participants). Of the 26 localities in arms 2 and 4, where CLTS had been applied, 11 had achieved a latrine coverage rate of over 80%. Of these, there were 2 and 4 localities in arms 2 and 4 respectively that achieved 100% coverage. Six (6) and 2 localities in arms 2 and 4, respectively, had coverage rates between 20 and 60%. Low coverage (<20%) was observed in 4 localities, namely one locality in arm 2 and 3 localities in arm 4. No change was recorded in one locality ("Gbamelèkro") of arm 2, as well as in 2 localities ("Ahondo" and "N'Kloidjo") of arm 4, in terms of latrine coverage (identical latrine rates during the two surveys).

Table 1. Household characteristics during the baseline survey, stratified by intervention arm, in central Côte d'Ivoire, August to September 2014

	Intervention arms							
	Arm 1		Arm 2		Arm 3		Arm 4	
	N	Mean or Percent	N	Mean or Percent	N	Mean or Percent	N	Mean or Percent
Demography								
Number of households	300	24,1 %	312	25,1 %	335	26,9 %	299	24,0%
Households size								
≤5 people	274	16,1 %	288	21,5 %	294	20,7 %	251	20,7 %
6-10 people	274	46,0 %	288	43,4 %	294	49,3 %	251	46,2 %
>10 people	274	38,0 %	288	35,1 %	294	29,9 %	251	33,1 %
Number of people per households	274	9,9	288	10,0	294	9,4	251	10,3
Occupations								
Agriculture	274	90,1 %	289	92,4 %	294	90,5 %	251	92,8 %
Fishing	274	2,2 %	289	3,5 %	294	5,1 %	251	2,0 %
Other occupations*	274	7,7 %	289	4,1 %	294	4,4 %	251	5,2 %
Wealth Quartile								
Most poor	274	23,0 %	289	30,4 %	294	29,2 %	251	37,1 %
Very poor	274	24,8 %	289	26,0 %	294	22,1 %	251	21,9 %
Poor	274	28,8 %	289	19,4 %	294	25,5 %	251	18,7 %
Least poor	274	23,4 %	289	24,2 %	294	23,1 %	251	22,3 %
Water, Sanitation and Hygiene (WASH) indicators								
Households with tap water	274	18,6 %	289	0,3 %	294	0,0 %	251	4,8 %
Other sources of water for households**	274	81,4 %	289	99,7 %	294	100 %	251	95,2 %
Households with latrines	274	20,1 %	289	14,9 %	294	27,2 %	251	21,5 %
Use latrines by households								
Never	274	78,8 %	288	84,4 %	294	70,4 %	251	80,5 %
Rarely	274	2,6 %	288	0,3 %	294	1,7 %	251	0,8 %
Often	274	2,2 %	288	1,0 %	294	1,7 %	251	0,4 %
Always	274	16,4 %	288	14,2 %	294	26,2 %	251	18,3 %
Practice of open defecation by households	274	82,8 %	288	76,7 %	294	79,3 %	250	76,8 %
Defecation in plantations/field								
Never	274	13,1 %	288	11,1 %	294	16,3 %	251	8,4 %

Rarely	274	10,6 %	288	13,9 %	294	13,9 %	251	11,6 %
Often	274	41,6 %	288	50,7 %	294	50,7 %	251	44,6 %
Always	274	34,7 %	288	19,1 %	294	19,1 %	251	35,5 %

* Housewife, Trader, Teacher, Breeder

** Drill/pump, Well, river/pond

N: Number

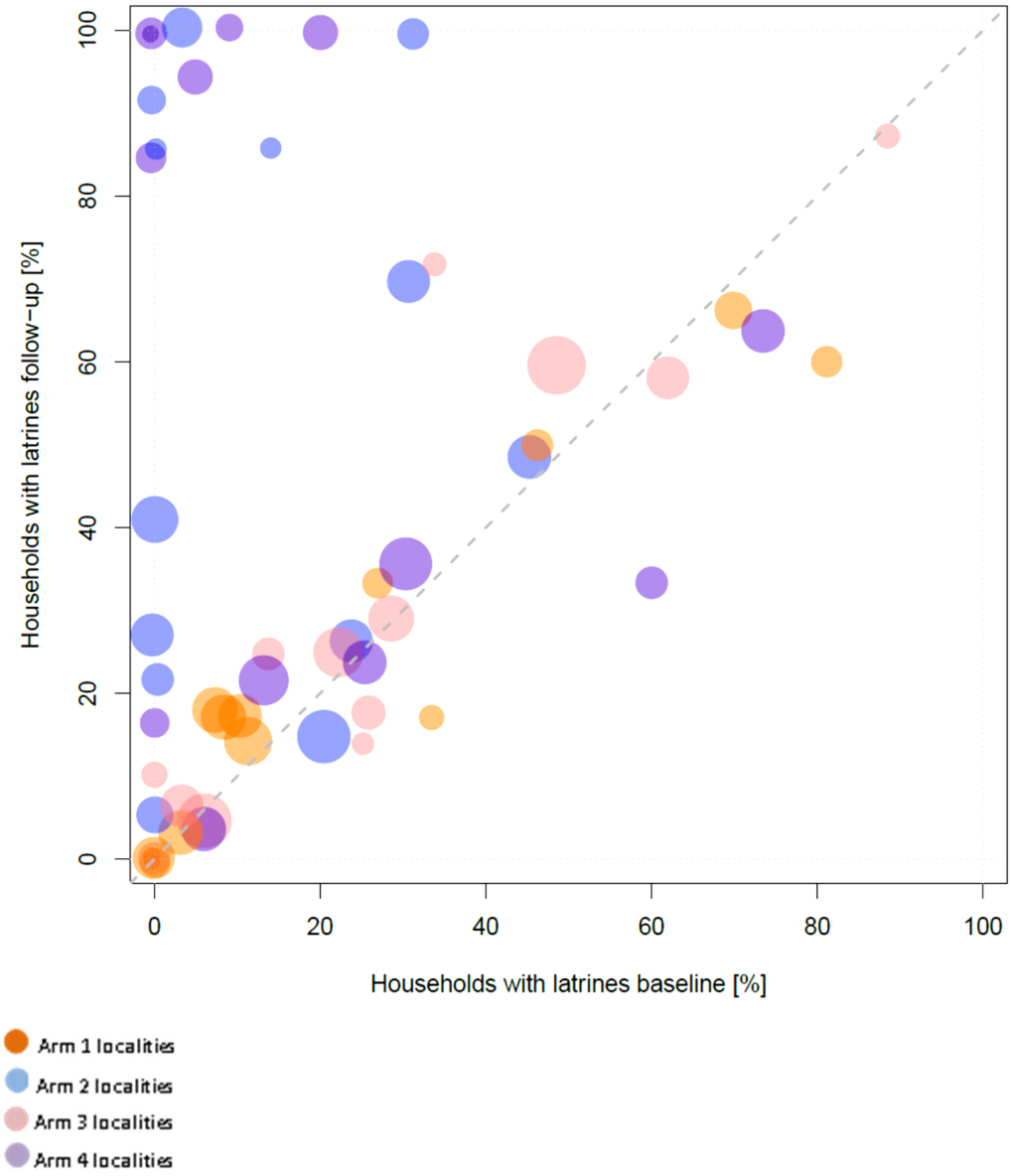

Figure 8. Latrine coverage in 54 localities in central Côte d'Ivoire

3.1.3 Demographic, Socio-Economic Characteristics and Water Sanitation and Hygiene (WASH) Indicators of Households, 17 Months Post Intervention

The proportion of households with more than 5 inhabitants was 78.1% in arm 1; 78.2% in arm 2; 78.5% in arm 3 and 80.1% in arm 4. The average number of persons per household was between 8 and 9.

Agriculture was the dominant activity in all the intervention arms. It was practised mainly by over 90% of households. Less than a quarter of the households interviewed were less poor households.

No households were supplied with tap water in arm 2. In contrast, the highest coverage rate of the drinking water distribution network ("SODECI") was recorded in arm 1 (9.2%). During this survey, the proportions of latrines increased in arms 2 (14.9 to 45.2%) and 4 (21.5 to 50.0%) compared to arms 1 (20.1 to 20.2%) and 3 (27.2 to 28.7%). In addition, in arms 2 and 4, household latrine use rates almost doubled (14.2% vs. 33.7% and 18.3% vs. 33.1%). Open defecation was practiced by 87.0% and 79.7% of households in arms 1 and 3 respectively. The proportions of households whose inhabitants always defecated in the plantations were 29.0% (arm 1); 11.5% (arm 2); 18.4% (arm 3) and 7.2% (arm 4) (Table 2).

Table 2. Household characteristics during the follow-up survey, stratified by intervention arm, in central Côte d'Ivoire, February 2016

	Intervention arms							
	Arm 1		Arm 2		Arm 3		Arm 4	
	N	Mean or Percent	N	Mean or Percent	N	Mean or Percent	N	Mean or Percent
Demography								
Number of households	272	25,2 %	286	26,5 %	278	25,8 %	242	22,5 %
Households size								
≤5 people	261	21,8 %	279	21,9 %	261	21,5 %	236	19,9 %
6-10 people	261	46,7 %	279	54,5 %	261	55,9 %	236	47,5 %
>10 people	261	31,4 %	279	23,7 %	261	22,6 %	236	32,6 %
Number of people per households	261	9,3	279	8,6	261	8,7	236	9,9
Occupations								
Agriculture	262	95,4 %	279	97,1 %	261	91,6 %	236	94,5 %
Fishing	262	0,8 %	279	2,2 %	261	7,7 %	236	22,1 %
Other occupations*	262	3,8 %	279	0,7 %	261	0,7 %	236	3,4 %
Wealth Quartile								
Most poor	262	21,0 %	279	35,5 %	261	34,1 %	236	31,8 %
Very poor	262	29,8 %	279	19,7 %	261	19,9 %	236	21,2 %
Poor	262	24,4 %	279	22,6 %	261	24,5 %	236	24,2 %
Least poor	262	24,8 %	279	22,2 %	261	21,5 %	236	22,9 %
Water, Sanitation and Hygiene (WASH) indicators								
Households with tap water	262	9,2 %	279	0,0 %	261	0,4 %	236	1,3 %
Other sources of water for households**	262	90,8 %	279	100 %	261	99,6 %	236	98,7 %
Households with latrines	262	20,2 %	279	45,2 %	261	28,7 %	236	50,0 %
Use latrines by households								
Never	262	80,2 %	279	55,2 %	261	66,3 %	236	49,2 %
Rarely	262	0,8 %	279	0,4 %	261	2,3 %	236	0,4 %
Often	262	3,4 %	279	10,8 %	261	11,1 %	236	17,4 %
Always	262	15,6 %	279	33,7 %	261	20,3 %	236	33,1 %
Practice of open defecation by households	262	87,0 %	279	73,5 %	261	79,7 %	269	74,3 %
Defecation in plantations/field								

Never	262	7,3 %	279	20,4 %	261	18,8 %	236	15,7 %
Rarely	262	27,1 %	279	36,2 %	261	18,8 %	236	38,6 %
Often	262	36,6 %	279	31,9 %	261	44,1 %	236	38,6 %
Always	262	29,0 %	279	11,5 %	261	18,4 %	236	7,2 %

* Housewife, Trader, Teacher, Breeder

** Drill/pump, Well, river/pond

N: Number

3.2 Discussion

The implementation of CLTS in rural localities in south-central Côte d'Ivoire largely contributed to an increase in latrine coverage in these villages, compared to those that did not receive interventions (14.9 to 45.2% (Arm 2); 21.5 to 50% (Arm 4) versus 20.1 to 20.2% (Am1); 27.2 to 28.7 (Arm3)). These rates are roughly equal to those obtained by (Patil et al., 2014), during a total sanitation campaign in rural India. However, much higher rates were found in Odisha in India (9 to 63% (intervention village) versus 8 to 12% (control village)) and Koulikoro in Mali (22 to 65% (intervention village) versus 24 to 35% (control village)) (Clasen et al., 2014; Pickering, Djebbari, Lopez, Coulibaly, & Alzua, 2015); during a rural sanitation programme. In addition, the rate of latrine use was assessed in this study. This would not be taken into account in various previous studies. This investigation showed that the villages that benefited from the intervention stood out in terms of latrine use (14.2 to 33.7%; 18.3 to 33.1%) compared to the control villages (16.4 to 15.6%; 26.2 to 20.3%).

Furthermore, CLTS process would be a relevant tool for changing the behaviour of rural communities with regard to open defecation. This approach was not detrimental to the villagers and was inexpensive. For the construction of the toilets, local materials were used, so that the cost of building the toilets became affordable and accessible for the rural community.

Limitations included the fact that it was difficult, if not impossible; to control all the environmental factors as well as the intrinsic factors of the communities as this was an applied study. A system of monitoring over time could not be initiated after the certification of villages for “End of Open Defecation (EOD)” status (post-intervention).

4. Conclusion

CLTS approach has improved the adherence of rural communities in Côte d'Ivoire to the construction and use of latrines. CLTS implemented on a large scale can contribute to achieving Sustainable Development Goal (SDG) 3 and 6, which is to ensure access to clean water and sanitation for all and enable everyone to live in good health and promote well-being at all ages.

Acknowledgments

We thank the Ministry of Sanitation and Drainage of Côte d'Ivoire and the United Nations Children's Fund (UNICEF) office in Côte d'Ivoire for their authorisation and support. We are very grateful to the Community Health Workers (CHW) and CLTS facilitators for their effective contribution in the field. A special mention to the rural communities for their enthusiastic participation.

Funding statement

UBS Optimus Foundation (Zurich, Switzerland) provided financial support for this project.

Ethics Approval

Ethical clearance for the study was obtained from the Ethics Committee of Basel in Switzerland (EKBB; reference no. 300/13, date of approval: November 11, 2013) and from the ethics committee of the Ministry of Health and Public Hygiene in Côte d’Ivoire (reference no. 76-MSLS-CNER-dkn, date of approval: November 28, 2013). The trial is registered (ISRCTN53102033, date of approval: March 26, 2014).

Conflicts of Interest

None declared.

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