Effects of Community-Led Total Sanitation on Malnutrition Status of Children Under 5 Years in Kwale County

Francis Gwama Mwatsahu[1*], Simon Karanja[1], Mohamed Karama[2], Michael Bruce Zimmermann[3] and Calvin Otieno[1]

1. *School of Public Health, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya .*
2. *Umma University, Kajiado, Kenya.*
3. *Department of Health Sciences and Technology, ETH, Switzerland.*

***Corresponding Author:** Francis Gwama Mwatsahu, School of Public Health, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya.
Email: francisgwamam@yahoo.com

Summary

INTRODUCTION

Malnutrition among children below 5 years negatively impacts their physical and cognitive development. The government and its development partners have implemented several strategies to eradicate malnutrition. Studies have suggested that there is a significant link between malnutrition and poor hygiene and sanitation practices. Poor hygiene and sanitation related practices are associated with undernutrition due to diarrhea, parasitic infections and environmental enteropathy. The aim of this study was to assess the effects of Community-Led Total Sanitation (CLTS) on malnutrition status of children under 5 years in Kwale County, Kenya.

MATERIALS AND METHODS

The study employed a quasi-experimental study design with one intervention and control site. The quasi experiment adopted a Pretest-Post Test Study approach. The intervention site received the Community-Led Total Sanitation (CLTS) intervention which included health education and construction of latrines. Fleiss method was used to determine the sample size where 402 and 405 respondents were sampled in the control and intervention sites respectively.

RESULTS

Data from the baseline survey shows that malnutrition rates were 53.2 % and 42.7 % in the control and intervention sites respectively. In the end term survey, malnutrition rates were 48.5% and 29.4% in the control and intervention sites respectively. Student T test showed a significant difference in the means of children suffering from malnutrition in intervention compared to control sites ($t = -5.675$, $p < 0.05$). Data further showed that children in the control site were three times more likely to suffer from malnutrition compared to children in the intervention site [(Adj. OR = 3.482, 95% CI= 2.453- 4.942, P<0.05)].

CONCLUSION

Community-Led Total Sanitation (CLTS) has proven to positively impact the nutrition status of children under 5 years. Thus CLTS needs to be continuously strengthened and up-scaled for communities and the nation to continuously enjoy its benefits, dividends which include the achievement of the 3rd Sustainable Development Goal of ensuring achievement of good health and well-being for all.

Key Words: *Malnutrition, CLTS, Children Under Five Years*

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Introduction

Globally undernutrition accounts for nearly 50% of all deaths of children under 5 years. In Africa the stunting and wasting rates among children under 5 years are 29.1% and 6.4%, respectively with stunting rates being higher than the global average of 21.3% (Globalnutrition, 2020). Furthermore according to the Kenya Health Demographic Survey (KDHS) stunting and wasting rates among children under 5 years are 26% and 4% respectively (KDHS, 2014). The immediate causes of malnutrition are usually diseases and inadequate food intake. Thus studies have established a link between nutrition status and infections which contributes to a lethal cycle of malnutrition and worsening illnesses (UNICEF, 2020).

Children are among the vulnerable population to a wide range of infections. Sanitation related infections accounts for the highest proportion of infections among children (Gizaw & Worku, 2019). For instance globally there is about 1.7 billion cases of childhood diarrhea with a further 525,000 children succumbing to diarrhea related diseases and parasitic infections annually (WHO, 2018).

Studies have suggested that there is a significant link between malnutrition and poor hygiene and sanitation practices. Poor hygiene and sanitation related practices are associated with undernutrition due to diarrhea, parasitic infections and environmental enteropathy (Jr *et al* ., 2008; Mondal *et al* ., 2012). Diarrhea and intestinal infestations cause loss of nutrients and diversion of nutrients from growth to the immune systems to fight the infection. Furthermore environmental enteropathy leads to increased small intestines permeability that causes a reduction in nutrient absorption (Jr *et al* ., 2008; Mondal *et al* ., 2012).

Community-Led Total Sanitation (CLTS) is one of the government strategies focused on improving sanitation status in communities through ensuring elimination of open defecation. CLTS was conceived in 1999 in Bangladesh and is now being implemented in 50 countries including Kenya (Alzua *et al* ., 2015). It was introduced in Kenya in 2007, several reports indicating that local governments have a key role to play in ensuring its full implementation. Furthermore the full realization of CLTS requires capacity building, external support, consistent and effective coordination between the local government staff and development partners (Assessment, 2015).

CLTS which triggers an Open Defecation Free (ODF) status to a community, to a great extent, will ensure reduced cases of diarrheal diseases and as such potentially promote good nutrition status among children. However with gaps in its implementation there

is a possibility of failure of realization of its full benefits and dividends. This, therefore, necessitates the assessment of CLTS in meeting its objectives with the aim of strategizing on how to further improve its implementation, to aid its redesign and modification.

In Kwale County the malnutrition rates are alarming with stunting, underweight and acute malnutrition rates of 29, 21 and 9% respectively. Furthermore the open defecation (OD) status in Kwale county is 51.2% (Kwale County Government, 2018). There is compelling association of malnutrition and diseases such as diarrhea among children under 5 years. This study aims at understanding the effect of CLTS on malnutrition status of children below 5 years.

Methodology

Study Area

The study area was Kinango Sub County in Kwale County, Kenya. Chengoni and Samburu locations were selected as intervention and control sites respectively. The Map in figure 1 and 2 below indicates the location of the study sites in Kenya

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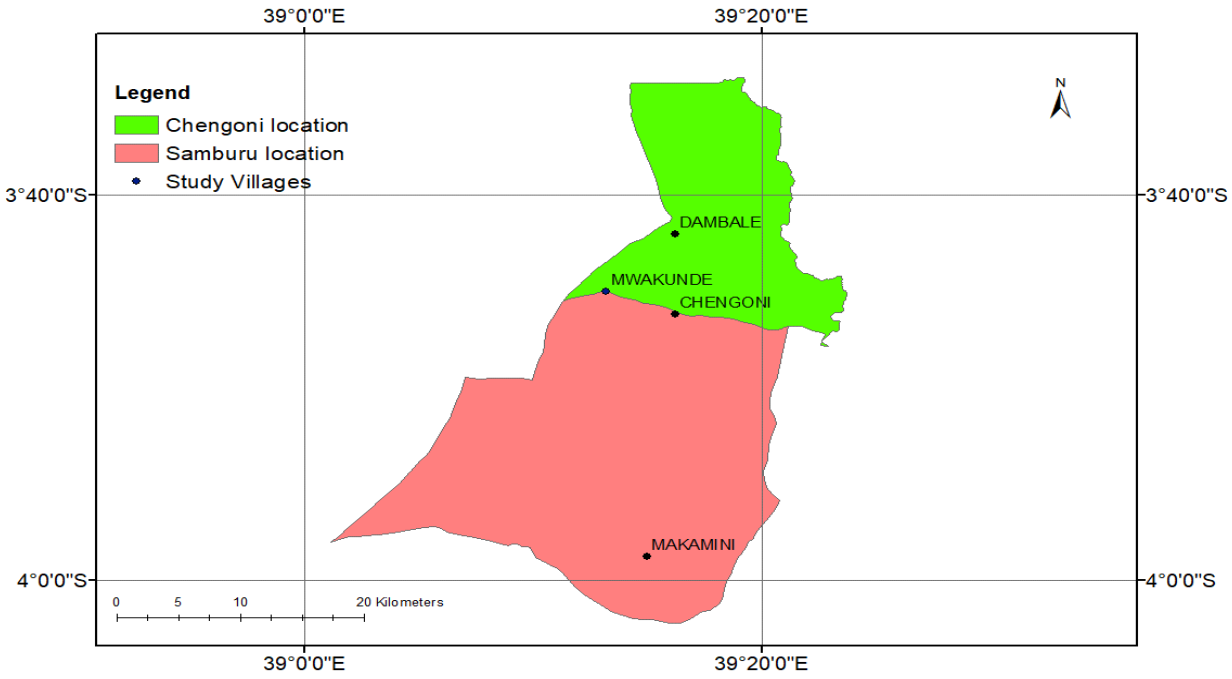

Figure 1: Map of Kinango Sub County Showing Intervention (Chengoni) and Control (Samburu) Sites

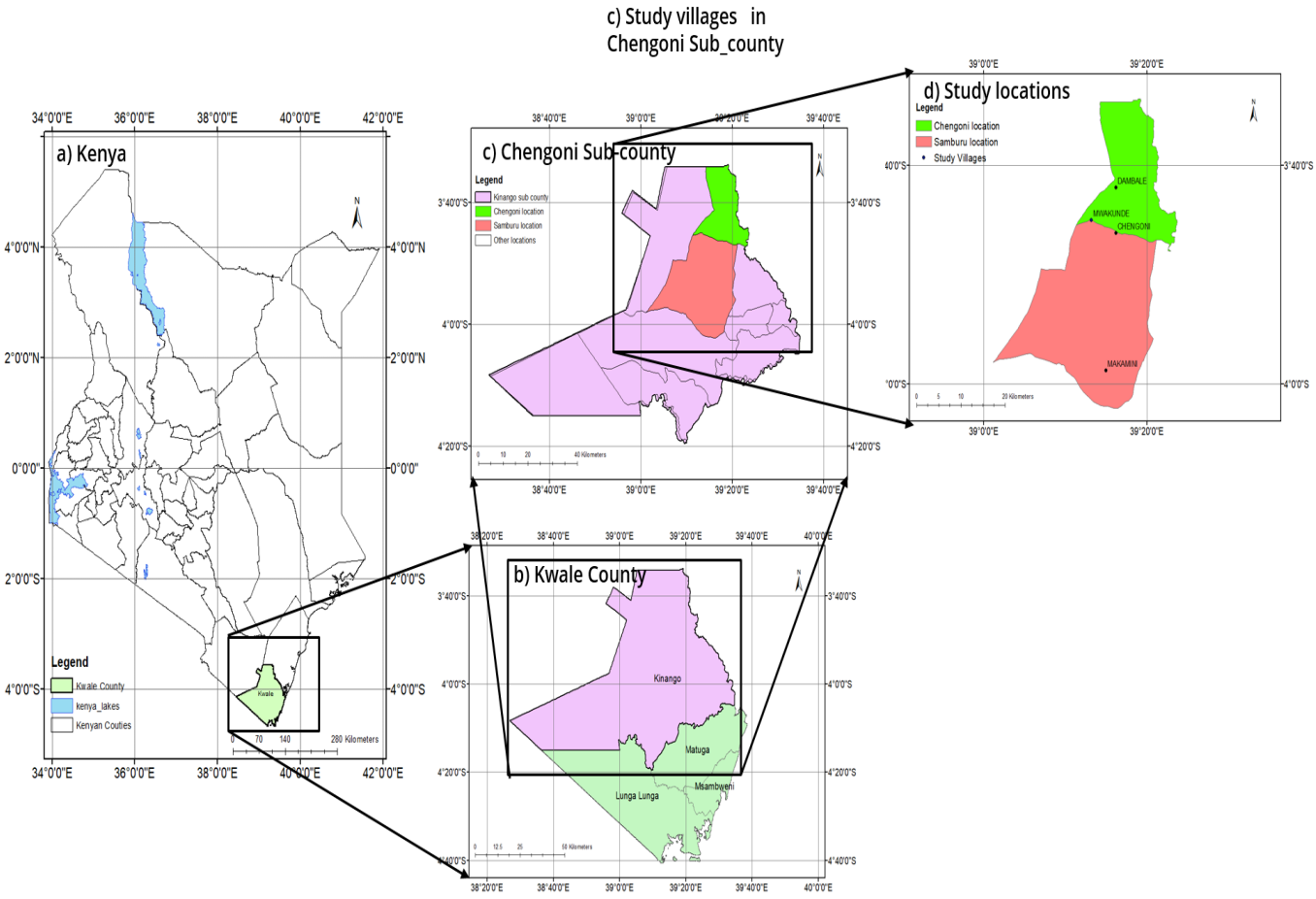

Figure 2: Map of Kenya Showing both Intervention and Control Sites in Kwale County

Study Design

The study adopted a quasi-experimental study design with one intervention and control site. The quasi experiment adopted a Pretest-Post Test Study approach

Study Population

These were children aged <5 years and their parents / guardians

The Intervention

The intervention site received the Community-Led Total Sanitation (CLTS) intervention while the control site received no sanitation related intervention at all.

Key Elements of the CLTS Intervention

In the Intervention site, the following activities were conducted: survey to establish the proportion of villages with evidence of open defecation, health education aimed at triggering community to adopt a positive behavior change in regard to sanitation, proper disposal of human excreta and construction of latrines using locally available materials.

Data Collection Procedure

Baseline data was collected in both intervention and control sites before intervention was initiated at the intervention site. The intervention was then rolled out in the intervention site for six months.

After 6 months end term data was collected in both Intervention and Control Sites

Data Collection Tools

Researcher-administered questionnaire was used to collect data. A Mid-Upper Arm Circumference (MUAC) tape was used to take anthropometric measurements and determine nutritional status.

Sample Size Determination

The sample size was determined using the Fleiss method [comparing 2 proportions of the target population) (Wang, 2007), thus:

n = (Zα/2+Zβ) 2 * (p1 (1-p1) +p2 (1-p2)) / (p1-p2)2,

Where:

n = Sample size in each group (assumes equal sized groups)

Zα/2 = the desired level of statistical significance (typically 1.96 for 5% level of significance)

Zβ = the desired power (typically 0.84 for 80% power).

P1-p2 = effect size i.e. reduction in diarrhea due to CLTS, set at 10%.

n = (1.96+0.84)2*(0.55(1-0.55) +0.45(1-0.45))/(0.1)2

n = 388.08 (approximately = 388 HHs per arm) Plus 10% for non-response (39)

n=427 per arm (Intervention and Control sites), sum of 854

Actual data collected was from 402 and 405 respondents in control and intervention sites respectively

Data Analysis and Presentation

Descriptive statistics were used to summarize the data. Student t-test (unpaired) was used to determine if there was a significant difference in the means of children with malnutrition at baseline and end term surveys respectively. Regression analysis was used to establish the odds of malnutrition among children in intervention site compared to control.

Results

Effect of CLTS on Nutrition Status of Children

In the baseline survey, close to a half and almost half of the children in the control and intervention site, respectively, were malnourished. In the end term survey, less than half and barely a quarter of the children in the control and intervention sites, respectively, were malnourished. Table 1 illustrating this data is presented at the appendix.

Data from the baseline survey shows that malnutrition rates were 53.2 % and 42.7 % in the control and intervention sites, respectively. In the end term survey data shows that the malnutrition rates were 48.5% and 29.4% in the control and intervention sites, respectively. This is shown on table 2

There was a significant difference in malnutrition rates between the control and intervention site at baseline ($p = 0.003$) and at end term ($p < 0.001$).There was also a significant difference in means of children suffering from malnutrition between the control and intervention sites at end term ($t = -5.675$, $p< 0.05$). Tables 3 and 4 presents these findings.

Effect of CLTS on Malnutrition

Table 5 and 6 illustrates that there was a significant difference in malnutrition between the control and intervention sites, at baseline, in both crude ratio [(OR = 1.527, 95% CI= 1.156- 2.015, P<0.05) and adjusted crude ratios [(OR = 1.481, 95% CI= 1.038-2.114, P<0.05)].

There was a significant difference in malnutrition between the control and intervention sites, at end term, in both crude odds ratio [(OR = 2.264, 95% CI= 1.694-3.025, P<0.05)] and adjusted crude odds ratios

[(OR = 3.482, 95% CI= 2.453- 4.942, P<0.05)].

The adjusted crude odds ratio shows that children in the control site were three times more likely to suffer from malnutrition as compared to children in the intervention site. This is shown in table 7 and 8.

Discussion

Effect of CLTS on Nutrition Status of Children below 5 Years

The key highlights of data in this study indicate that Community-Led Total Sanitation (CLTS) was effective in improving nutrition status of children in intervention site compared to control site. Student t-test indicated a significant difference in the means of children with malnutrition in the intervention site compared to the control site.

Regression analysis quantified this significance by indicating that children in the control site were three times more likely to suffer malnutrition as compared to those in intervention site. This could be attributed to the fact that CLTS led to improved management of human faecal matter. This further led to better control of helminthic infections among children. Helminthes have been known to compete for nutrients in the gut of children leading to malnutrition. This lack of competition especially in the intervention site could have led to improved nutrition status of children**.**

This observation could also be attributed to reduced cases of diarrhea and sanitation-related childhood illnesses in the intervention site which are the immediate causes of malnutrition. Studies have shown that diarrheal diseases cause malnutrition in children below 5 years (Nacher *et al* ., 2002).

Studies have further established a correlation between CLTS and protection of children against environmental enteropathy or leaky gut syndrome among children below 5 years. Environmental enteropathy has been shown to have more far-reaching consequences on stunting than even diarrhea (UNICEF/EAPRO, 2016). A study conducted in Mali on CLTS intervention reported a reduction in the rates of stunting by about 6 % (Alzua *et al* ., 2015). Equally studies have documented that components of CLTS such as Water Sanitation and Hygiene (WASH) interventions have a positive impact on the nutritional status of children below 5 years (Gizaw & Worku, 2019). This basically shows that preventing faecal contamination exposure to children is crucial in ensuring improvement of child health. However based on a study conducted in India, CLTS intervention was reported to have no impact of child nutrition status. The contrast in findings between these studies could be attributed to differences in study designs whereby in controlled randomized trials positive results were realized while in large programs the benefits of CLTS on child health and nutrition are not guaranteed (Patil *et al* ., 2015).

Studies have further documented that combined interventions yield better results in terms of nutrition status of children as compared to single interventions. For instance hand washing or food safety or treatment of drinking water by itself may not prevent the occurrence of faecal-oral diseases which are associated with malnutrition. However, the integration of all these components, as seen in CLTS, brings about synergy and ultimately improved nutrition status (Bartram & Cairncross, 2010; WHO, 2014).

Conclusion

CLTS was found to be effective in improving nutrition status of children in intervention compared to control sites where this intervention was not implemented. Student t-test showed a significant difference in the means of children suffering from malnutrition in intervention compared to

control sites (t = -5.675, p< 0.05). Data further showed that children in the control site were three times more likely to suffer from malnutrition compared to children in the intervention site [(Adj. OR = 3.482, 95% CI= 2.453- 4.942, P<0.05)]. Based on this study CLTS has a positive impact on the nutrition status of children under 5 years.

Recommendations

CLTS has shown to positively impact the nutrition status of children under 5 years. Hence, CLTS needs to be continuously strengthened and up-scaled for communities and the nation to continuously enjoy its benefits and dividends which includes the achievement of the 3rd SDG on ensuring achievement of good health and well-being.

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Appendix

Table 1: Nutrition Status of Children below 5 Years in Kwale County

Categories	**Baseline survey**				**End term survey**			
	Control		Intervention		Control		Intervention	
	F	%	F	%	F	%	F	%
No Malnutrition	188	46.8	232	57.3	207	51.5	286	70.6
Mild Malnutrition	112	27.9	109	26.9	98	24.4	54	13.3
Severe Malnutrition	102	25.4	64	15.8	97	24.1	65	16.0
Total	402	100.0	405	100.0	402	100.0	405	100.0

Table 2: Nutrition Status of Children below 5 Years

Categories	**Baseline survey**				**End term survey**			
	Control		Intervention		Control		Intervention	
	F	%	F	%	F	%	F	%
Malnutrition	214	53.2	173	42.7	195	48.5	119	29.4
No form of malnutrition	188	46.8	232	57.3	207	51.5	286	70.6
Total	402	100.0	405	100.0	402	100.0	405	100.0

Table 3: Comparison of Nutrition Status of Children in Control and Intervention Site

Categories	Baseline survey			End term survey		
	Control (F)	Intervention (F)	Pearson Chi-Square P value	Control (F)	Intervention (F)	Pearson Chi-Square P value
Malnutrition	214	173	0.003	195	119	<0.001
No form of malnutrition	188	232		207	286	
Total	402	405		402	405	

Table 4: Student T Test of Nutrition Status among Children below 5 Years in Intervention and Control Site at End Term

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Child with anyform of malnutrition (Severe, Acute, or Global Malnutrition)	Equal variances assumed	80.785	.000	-5.675	805	.000	-.191	.034	-.257	-.125
	Equal variances not assumed			-5.673	797.047	.000	-.191	.034	-.257	-.125

Table 5: Crude OR for Malnutrition at Baseline

Variables in the Equation

								95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Study Arm	.423	.142	8.909	1	.003	1.527	1.156	2.015
	Constant	-.130	.100	1.679	1	.195	.879		

a. Variable(s) entered on step 1: Study Arm.

Table 6: Adjusted Crude Odds Ratio of Malnutrition at Baseline

Variables in the Equation

								95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Study Arm	.393	.181	4.687	1	.030	1.481	1.038	2.114
	Age of respondent	-.166	.169	.970	1	.325	.847	.608	1.179
	Number of children of respondent	-.044	.120	.134	1	.715	.957	.756	1.212
	Level of education of respondent	.278	.139	4.002	1	.045	1.320	1.006	1.733
	Marital status	.248	.161	2.361	1	.124	1.281	.934	1.758
	Primary Occupation of respondent	1.186	.146	66.387	1	.000	3.274	2.461	4.354
	Average Monthly Income	.000	.000	8.903	1	.003	1.000	1.000	1.000
	Constant	-2.414	.553	19.068	1	.000	.089		

a. Variable(s) entered on step 1: Study Arm, Age of respondent, Number of children of respondent, Level of education of respondent, Marital status, Primary Occupation of respondent, Average Monthly Income .

Table 7: Crude OR for Malnutrition at End Term

Variables in the Equation

								95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Study Arm	.817	.148	30.547	1	.000	2.264	1.694	3.025
	Constant	.060	.100	.358	1	.550	1.062		

a. Variable(s) entered on step 1: Study Arm.

Table 8: Adjusted Crude Odds Ratio of Malnutrition at End Term

Variables in the Equation

							95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Study Arm	1.247	.179	48.713	1	.000	3.482	2.453	4.942
	Age of respondent	-.314	.178	3.096	1	.078	.731	.515	1.036
	Number of children of respondent	-.035	.138	.063	1	.802	.966	.737	1.267
	Level of education of respondent	.088	.139	.402	1	.526	1.092	.832	1.435
	Marital status	-.146	.162	.803	1	.370	.865	.629	1.189
	Primary Occupation of respondent	1.474	.163	81.789	1	.000	4.365	3.172	6.007
	Average Monthly Income	.000	.000	.177	1	.674	1.000	1.000	1.000
	Constant	-.742	.543	1.863	1	.172	.476		

a. Variable(s) entered on step 1: Study Arm, Age of respondent, Number of children of respondent, Level of education of respondent, Marital status, Primary Occupation of respondent, Average Monthly Income.