



# Community Knowledge and Attitude on Community Led Total Sanitation after Open Defecation-Free Certification of Balaka District in Malawi

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**Abstract:** *Community-Led Total Sanitation is a sanitation behaviour change approach aimed at stopping open defecation. It compels communities to sustainably construct latrines, use them and wash their hands with soap after open defecation. Change of behaviour for the Sustainability of these practices is a challenge as communities return to open defecation. The study evaluated community knowledge and attitude toward Community-Led Total Sanitation in Balaka District, the first Open Defecation Free certified model District in Malawi four years after Open Defecation Free status certification. Descriptive cross-sectional study design adopting both quantitative and qualitative data collection methods was used. Data was collected from heads of household (438) and Focused Group Discussion (6) sessions. Communities have adequate knowledge on Community-Led Total Sanitation and Open defecation status and a positive attitude towards Community-Led Total Sanitation implementations and open defecation status despite having very low hand washing facility coverage (36%, n=158) and hand washing with soap after defecation (24% n = 105). Knowledge has no influence on latrine use and hand washing facility construction ( $p > 0.05$ ) while attitude has influence on hand washing facility construction ( $p < 0.05$ ) in Balaka. Emphasis is required on health promotion on hand-washing facility construction and washing hands with soap to ensure sustainable sanitation practices beyond ODF certification.*

**Keywords:** *Certification, Community Led Total Sanitation, Hand-washing with soap, Open defecation, Sustainable sanitation.*

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## 1. Introduction

Globally, there is consensus that poor sanitation and hygiene has negative health impacts on communities. Poor sanitation and hygiene and the practice of open defecation predispose people to sanitation related disease (Njuguna, 2016, Tessema, 2017). Open defecation is defecating in open fields or water sources and leaving the faeces exposed (Kar & Chambers, 2008, Jain et al., 2020; Saleem et al., 2019). Globally, poor sanitation and hygiene and open defecation are considered the main causes for diarrhea deaths in under five children each year

(Wolf et al., 2018). One of the basic things that contribute to this is people's sanitation and hygiene knowledge and attitude on latrine and hand-washing facility construction latrine use and washing hands with soap (Linggar et al. 2019, Ejemot-Nwadiaro et al. 2015).

Sustainable Development Goal 6.2 of the United Nations on sanitation is to 'achieve access to adequate and equitable sanitation and hygiene for all and end open defecation by 2030. (UNDP, 2019). Community-led total sanitation (CLTS) is a community-based intervention aimed at stopping open defecation (Cairn cross et al.

2010). Ending open defecation is not only demonstrated by the building and retaining of toilets and hand washing facilities, it is whether those facilities are used in a proper way and by all (Tesserae, 2017). CLTS makes communities realize that they are ingesting their own feces thereby encouraging the construction and consistent use of toilets and hand washing with soap after defecation (Jensen, et al, 2015).

The CLTS strategy started in Bangladesh by Kamal Kar in 2004 and has spread to several countries in Asia and Africa. Malawi adopted CLTS in 2008, asserting the country to become open defecation free by 2015 which was not reached (Maulit and Kang, 2011,. GoM 2018). By 2017 four Districts of Dowa, Balaka, Rumphu and Mzimba North were declared ODF status and Balaka was selected as an ODF model district. They had latrine and hand-washing facility coverage latrine use and hand-washing with soap practice of over 95% following Level One open defecation certification standard (GoM 2018)

The Government of Malawi, using the National Sanitation and Hygiene Strategy (NSHS), 2018-2024 planned to make the country open-defecation free by 2025. This is in line with the SDG 6.2 aimed at ending open defecation by 2030. In the year 2018, Malawi had an open defecation free status of 41.7% (GoM, 2018). In 2019 hand washing with soap practice remained as low as 10% (UNICEF, 2019). Balaka, the Open Defecation Free Status Model District returned to Open defecation with latrine coverage and hand washing facility coverage, latrine use and hand washing with soap practice of less than 95% (GoM 2018). Sustainability of ODF status is reliant on community knowledge and attitude on CLTS and ODF. CLTS provides adequate sanitation and hygiene knowledge to individuals and communities (Kapatuka, 2013). The knowledge of CLTS is vital as it helps individuals understand the health benefits of defecating in a latrine and washing hands with soap after defecation. Latrine cleanliness, safety and security promotes the attitude of individuals towards latrine use. This helps to reduce the prevalence of preventable diseases that are associated with poor sanitation and hygiene such as cholera and diarrhoea (Okolimong et al., 2020).The study was then conducted to determine the knowledge and attitude of the community on latrine and hand-washing facility construction, latrine use and hand-washing with soap after defecation four years after open defecation free status certification of Balaka District.

## 2. Literature Review

### 2.1 Community Led Total Sanitation Strategy

Community-Led Total Sanitation (CLTS) is an integrated approach to achieving and sustaining open defecation-free status. It entails the facilitation of the community's analysis of their sanitation and hygiene practices and their consequences, leading to collective action to become an open defecation free community (Kar and Chambers, 2008 and GoM, 2018).

Open defecation is an aspect of poor sanitation. It is the practice of defecating outside and not into a designated toilet, leaving faeces exposed. Open defecation-free (ODF) is when no faeces are openly exposed to the air. It is a key term for CLTS which principally means the eradication of open defecation in the entire community (Jain et al., 2020; Saleem et al., 2019). Implicitly it means that all community members have access to and are using a latrine. Though different countries define ODF differently, generally ODF rests on: there being no faeces in the open, everyone using a basic latrine and there being a hand washing station with water and soap and used habitually(WSSCC, 2019).

In Malawi, Open defecation free status declaration requires that almost 95 % of households must have latrines and that all latrines must have hand washing facilities (GoM, 2018).Other requirements of an ODF status include that all latrines must offer safety and privacy, a roof to protect the user, a hand washing facility nearby with water and soap for washing hands with soap after using a toilet (GoM) 2018). Failure to maintain the above-mentioned indicators implies that a community has not sustained ODF status and therefore the members are considered to be eating each other's faeces (Kar and Chamber, 2008).

Toilet use and hand hygiene remains central to achieving Sustainable Development Goal (SDG) 6. Availability of hand washing facilities for and soap for hand washing with soap are a prerequisite at every toilet (Mara & Evans 2018). Evidence indicate that hand washing is nearly 85% effective in removing microorganisms in the hands (UNICEF, 2020). Households having hand washing facilities ranged from 15% in Sub-Saharan Africa to 76% in Western Asia and North Africa (Mara & Evans 2018; United Nations 2020). This indicated that only 19% of the world's population wash hands particularly after visiting the toilet (Wolf et al., 2018, GHP, 2020). In Malawi, only 10% per cent of households have hand washing facilities with soap which is an indicator of poor hand washing practice (UNICEF, 2020).

A lot of research has been conducted worldwide but conditions that lead people to fail to move up the sanitation ladder or backslide to OD are unclear (Mosler, Mosch, and Harter, 2018). In 2020, Jain et al. reported that other people practice open defecation out of necessity as a choice rather than out of a preference for the behaviour. In Rural Nepal, open defecation was reported to occur habitually as a way to socialize and for convenience (Bhatt et al. 2019). Other studies in Malawi, Uganda, Kenya, Bangladesh indicate that knowledge of community on CLTS affects latrine and hand-washing facility coverage, latrine use and washing hands with soap after defecation (Kapatuka, 2013, Lawrence et al. 2016, Okolimong et al., 2020, Booked, 2020).

## **2.2 Community Knowledge on Community Led Total Sanitation and Open Defecation Free Status**

Knowledge of the community on sanitation and hygiene plays a greater role in the implementation of CLTS for the attainment and sustenance of open defecation-free status. CLTS helps in educating and creating sanitation awareness among communities. It provides adequate sanitation and hygiene knowledge to individuals and communities (Kapatuka, 2013). The knowledge is vital as it helps individuals understand the health benefits of defecating in a latrine and washing hands with soap after using a latrine. The health benefits include improvement of sanitation standards such as cleanliness, safety, security that influence latrine use. This helps to reduce the prevalence of preventable diseases that are associated with poor sanitation and hygiene such as cholera, dysentery and eye infections (Okolimong et al., 2020).

CLTS strategy is meant to instill changed behaviors towards practicing good sanitation, and personal hygiene. It increases knowledge and improves behavioral practices in communities (Kar & Chambers, 2008). Nevertheless, such practices remain inconsistent and unsustainable after phasing out of the intervention program (Odagirio et al 2017). A study conducted in Bangladesh on WASH Programme five years after phasing out indicated that communities had inadequate knowledge and poor sanitation and hygiene practices (Ejemot-Nwadiaro et.al.2015) Because of inadequate knowledge, a report from Kajiado, Kenya, showed that some households had latrines but were not using them(Bokea, 2020). A study by WSP, in 2011 found that inadequate knowledge made it difficult for communities to take hand washing as a priority because communities significantly feared HIV/AIDS and malaria compared to diarrhea. They were believing that diarrhea does not cause death. A study on Global Scaling up of Hand washing conducted in Senegal indicated that women who had good knowledge of key

hand washing times practiced hand washing with soap for understanding its importance (Coombes and Devine, 2010)

A comparative study in Uganda by Okolimong et al., in 2020 on CLTS implementors and non-implementors found that those that were in CLTS intervention area had higher knowledge of sanitation and hygiene than those in the non-intervention area. Diarrhoea prevalence was even lower in the CLTS intervention area than in the CLTS non-intervention area. Another study by Lawrence et al. in 2016 also found that those with adequate sanitation and hygiene knowledge are more likely to have latrines and hand-washing facilities

## **2.3 Community attitude towards Community Led Total Sanitation CLTS and Open Defecation Free Status**

Community Led Total Sanitation implementation has been reported to be affected by community attitude (WHO, 2018). Attitude strongly influences the impact of CLTS firmly meant to improve sanitation practices like latrine use and washing hands with soap after defecation (Kapatuka, 2013). CLTS triggering mechanism and tools used during triggering such as the walk of shame to point out areas where people go to defecate human faeces helps trigger the community to have a negative attitude toward open defecation. Such a triggering mechanism provokes the social norm of open defecation and irritates people that they ingest their own and other people's faeces, a message that evokes a degree of disgust and shame (Sigler et al., 2014).

Poor sanitation conditions affect mostly girls and women. Social factors like inadequate or lack of safety and privacy bring a negative attitude towards latrine use (Merga et al., 2015 and Okolimong et al., 2020). A study by Harvey in 2011 found that men are embarrassed for not being duly concerned about the dignity of their women folk. Incidents of molestation and rape of women who were going out into the open for defecation were reported. This brought a negative attitude towards open defecation among women and influenced men to induce women to take latrine use as a norm for their safety. Unhygienic and poor sanitation standards also lead to poor health outcomes, particularly for children. The availability of unlooked-for and dirty hand-washing facility and soap discourages washing hands after defecation (Thys et al., 2015 and WHO, 2018)

### 3. Methodology

The study used a mixed cross-sectional study approach. It was conducted among households from three Traditional Authorities, Sawali, Kalembo and Nsamala. Two villages were selected from one Group Village Headman in each Traditional Authority. Approval to conduct the research was obtained from Mzuzu University Research Ethics Committee and Balaka District Council.

A total of 438 households responded to the survey questionnaire. A multistage random sampling technique was used to select the three Traditional Authorities, three Group Village Headmen and three Villages. Systematic sampling was used to select a representative sample size proportionally basing on the village population. Data was collected from heads of households, Village Health Committee and Village Development Committee members.

Quantitative data was collected from household interviews using semi structured questionnaires and observation using observation checklist were used. Qualitative data was collected through focus group discussion interviews with Village Health Committee and Village Development Committee members were conducted using focus group discussion guidelines.

The questionnaire included socio-demographic characteristics such as age, gender, education level, occupation, religion, ethnicity and family size. The second part had questions on community knowledge and attitude towards sanitation practices after ODF certification. These included latrine and hand-washing facility construction, latrine use and hand-washing with soap after defecation. Latrine safety, privacy, cleanliness, availability latrine use, hand-washing with soap, aims, importance and health benefits of having and using a latrine and a hand-washing facility. Likert Scale responses were given scores from 1- 4, strongly disagree (1), disagree (2), agree (3) or strongly agree (4). The Likert scale scores were used to determine the level of knowledge and attitude of the respondents. Interpretation of mean scores was in level ranges. Mean scores in the range 1.0-2.4 represent inadequate knowledge and negative attitude, 2.5-3.4 represent average knowledge and neutral attitude and while 3.5-5.0 represent adequate knowledge and positive attitude (Wanjohi and Syokau, 2020).

Association between categorical variables was examined using regression analysis. Determination of group differences in knowledge and attitude score used Independent t-test or one-way ANOVA. SPSS version 25.0 (IBM Corporation, USA) was used for all statistical analyses. The data were analyzed using the Statistical Package for Social Sciences (SPSS) version 25.

## 4. Results and Discussion

### 4.1 Socio-demographic characteristics of of study participants

A total of 438 heads of households were interviewed. The majority of the heads of households were females (57.8%,  $n = 253$ ) married (79.0%,  $n = 346$ ) and having 45 years or more (31.7%,  $n = 139$ ). On education, religion and ethnicity, the majority only attended primary school (62.3%,  $n = 273$ ), Christians (63.2%,  $n = 277$ ) and Yaos (74.2%,  $n = 325$ ) respectively. The occupation of the majority of the households is farming (65.1%,  $n = 285$ ). Most of the households live in brick wall houses but with grass-thatched roofs (36.3%,  $n = 159$ ). On the size of household, the majority have 3-4 (29.2%,  $n = 128$ ) and 5-6 (29.0%,  $n = 127$ ) children (Table 1)

### 4.2 Latrine and hand washing facility availability, latrine use and washing hands with soap after defecation

Results indicate that the majority of the households had latrines (89%,  $n = 390$ ). The heads of households were asked if they use latrines and the majority said that they always use latrines (96%,  $n = 419$ ). The majority of those who fail to use latrines said that they fail for being afraid of falling into the toilet (40.4%,  $n = 8$ )

Results indicate that slightly above one third of households do not have a hand washing facility (36%,  $n = 160$ ). Respondents were asked whether they wash their hands with soap after using a latrine. Only close to one quarter always wash their hands with soap after defecation (24.0%,  $n = 108$ ). Those who sometimes and always don't wash their hands with soap after defecation ( $n = 330$ ) said that it is mainly due to the unavailability of water in the hand-washing facility (57.9%,  $n = 191$ ) and unavailability of soap at the hand washing facility (24.8%,  $n = 82$ ) forgetting (14.8%,  $n = 49$ ) and hurrying (2.4%,  $n = 8$ )

**Table 1: Demographic characteristics of respondents**

Variable	Description	Frequency (n)	Percentage (%)
Gender	Female	253	57.8
	Male	185	42.2
Age	9-17	2	0.5
	18-26	88	20.1
	27-35	110	25.1
	36-44	99	22.6
	45-above	139	31.7
Marital status	Divorced	20	4.6
	Married	346	79.0
	Separated	6	1.4
	Single	17	3.9
	Widowed	47	10.7
Religion	Christian	277	63.2
	Islam	157	35.8
	None	4	1.0
Education level	No School	96	21.9
	Primary	273	62.3
	Secondary	69	15.85
Type of House	Brick grass roof	159	36.3
	Brick, Iron roof, cement floor	87	19.9
	Brick, Iron roof mud floor	117	26.7
	Mud floor grass roof	75	17.1
Occupation	Artisan	11	2.5
	Business	129	29.5
	Civil Servant	7	1.6
	Farming	285	65.1
	Casual labour	4	0.9
	None	2	0.5
Ethnicity	Lomwe	42	9.6
	Mchewa	57	13.0
	Ngoni	13	3.0
	Tumbuka	1	0.2
	Yao	325	74.2
	Others	15	3.4
Size of HH	1-2	24	5.5
	3-4	127	28.9
	5-6	128	29.2
	7-8	107	24.2
	9-10	49	11.2
	11 & above	3	0.7

### 4.3 Knowledge of community on Community Led Total Sanitation after Open Defecation Free Status Certification

On Knowledge of the respondents on the main aim of CLTS, the majority strongly agreed that ODF is more about constructing a latrine (72.2%,  $n = 316$ ) using it for defecation (72.2%,  $n = 316$ ) and washing hands with soap

after defecation (65.5%,  $n = 287$ ) (Table 2) Regarding the knowledge of the respondents on CLTS, Open defecation-free status and its importance, most of the respondents strongly agreed that using a latrine prevents the spread of diarrhoea (77.4%,  $n = 339$ ), worm infestations (75.5%,  $n = 331$ ) and eye infections (67.8%,  $n = 297$ ). Most of the respondents strongly agreed that hand washing with soap after defecation helps to kill germs in the hands (70.1%,  $n = 307$ ). Further to this, the results also revealed that respondents knew other key hygiene and sanitation issues.

Most respondents strongly agreed that ODF status is about water protection (70.3%,  $n = 308$ ) (Table 2)

The results revealed that respondents had adequate knowledge on all the variables asked. The mean score for each variable and the overall score (3.7) was between 3.5–5.0 representing those respondents had adequate knowledge on CLTS and ODF after ODF certification (Table 2)

During focus group discussion, some members said that:

*“CLTS sessions have increased the knowledge of the community on Hygiene and sanitation such that people construct and use latrine. Those found open defecating are wooed or forced to remove. This has led to reduction of the occurrence of diseases like diarrhoea and cholera is not there anymore”*

*“Although it is difficult to have a modern latrine and a durable hand washing facility all the time, people have understood the need to have and use a latrine and wash hands after using a toilet..”*

**Table 2: Knowledge of community on Community Led Total Sanitation after Open Defecation Free Certification**

Independent variable	Participant Response $n = 438$ (100%)				Score		Knowledge Level
	Strongly Disagree	Disagree	Agree	Strongly Agree	Total Score	Mean Score	
CLTS aims at communities attaining ODF	1(0.2%)	3(0.7%)	124(28.3%)	310(70.8%)	1619	3.7	Adequate
ODF is more about constructing a latrine	1(0.2%)	4(0.9%)	117(26.7%)	316(72.2%)	1624	3.7	Adequate
ODF is more about using a latrine	1(0.2%)	4(0.9%)	117(26.7%)	316(72.2%)	1624	3.7	Adequate
Use of a latrine prevents the spread of diarrheal diseases	1(0.2%)	1(0.2%)	97(22.17%)	339(77.4%)	1650	3.8	Adequate
ODF prevents the spread of worm infestations	1(0.2%)	1(0.2%)	105(24.0%)	331(75.5%)	1642	3.7	Adequate
DF is also about water protection,	1(0.2%)	1(0.2%)	128(29.2%)	308(70.3%)	1619	3.7	Adequate
Poor hygiene causes eye infections	1(0.2%)	2(0.5%)	138(31.5%)	297(67.8%)	1607	3.7	Adequate
ODF is also about HWWS after using a latrine	1(0.2%)	1(0.2%)	149(34.0%)	287(65.5%)	1598	3.6	Adequate
HWWS soap kill germs in the hands	1(0.2%)	2(0.5%)	128(29.2%)	307(70.1%)	1617	3.7	Adequate
<b>Overall Mean Score</b>						<b>3.7</b>	<b>Adequate</b>

*CLTS: Community Led Total Sanitation, ODF: Open Defecation Free, HWWS Hand Washing With Soap*

*Likert scale mean score interpretation: 1.0-2.4 (Inadequate Knowledge), 2.5-3.4 (Average Knowledge) and 3.5-5.0 (Adequate Knowledge).*

#### **4.4 Association between community knowledge on community Led Total Sanitation and Open Defecation Free Status practices after certification**

The study also wanted to ascertain whether knowledge influences latrine and hand washing facility construction,

latrine use and washing hands with soap. Regression coefficients results in Table 3 show that all variables on CLTS and ODF knowledge have no significant relationship with latrine construction and use ( $p > 0.05$ ). Knowledge that CLTS aims at attaining ODF status and that HWWS kills germ in hands has positive and significant relationship on washing facility availability ( $\beta = 0.083$ ,  $p = 0.033$ ), ( $\beta = 0.139$ ,  $p = 0.027$ ) respectively. There is also significant relationship between washing hands with soap after defecation and knowledge that ODF

is about HWWS after defecation ( $\beta = -0.157, p = 0.007$ ), HWWS after defecation kills germs in the hands ( $\beta = 0.180, p = 0.003$ ) and that poor hygiene causes eye infections ( $\beta = -0.167, p = 0.011$ ) (Table 5).

Analysis of Variance regression model indicate no statistical significance between knowledge and latrine construction and use (Table 5) but shows significant relationship with hand-washing facility availability ( $F = 2.571, p = 0.005$ ) and hand-washing with soap after defecation ( $F = 5.698, p = 0.000$ ) (Table 6). This suggests that the knowledge on CLTS and ODF collectively has effect on hand-washing facility availability and washing hands with soap after defecation ( $p < 0.05$ ) with no significant relationship of the knowledge model with latrine construction and latrine use. ( $p > 0.05$ )

**Table 3 Uni-variate Analysis of association of community knowledge on community led total sanitation and latrine availability and latrine use**

CLTS and ODF Knowledge Variable	Latrine Availability					Latrine Use				
	Standardised Coeff (Beta)	Std Error	t-value	P-value	95% CI	Standardised Coeff (Beta)	Std Error	t-value	P-value	95% CI
CLTS about latrine construction	-0.146	.0040	-1.745	0.082	-0.147 - 0.009	0.101	0.066	1.202	0.230	-0.050 - 0.208
CLTS about using a latrine all the time	-0.146	.0040	-1.745	0.082	-0.147 - 0.009	0.101	0.066	1.202	0.230	-0.050 - 0.208
CLTS aims at attaining ODF status	0.011	0.041	0.125	0.901	-0.076 - 0.086	0.01	0.068	0.119	0.905	-0.125 - 0.141
Village verified ODF	0.106	0.032	1.445	0.149	-0.017 - 0.109	-0.11	0.053	-1.508	0.132	-0.183 - 0.024
Latrine use prevents diarrhea	-0.014	0.040	-0.184	0.854	-0.086 - 0.072	-0.003	0.066	-0.041	0.967	-0.133 - 0.128
Open defecation spreads worm infestations	0.102	0.046	1.137	0.256	-0.038 - 0.142	-0.117	0.075	-1.305	0.193	-0.247 - 0.050
ODF is also about water protection	-0.113	0.042	-1.315	0.189	-0.137 - 0.027	0.063	0.069	0.729	0.466	-0.085 - 0.185
ODF is also about HWWS soap after defecation,	0.005	0.029	0.076	0.939	-0.054 - 0.058	0.047	0.047	0.778	0.437	-0.056 - 0.129
HWWS kills germs in hands	0.016	0.031	0.243	0.808	-0.053 - 0.068	-0.035	0.051	-0.542	0.588	-0.127 - 0.072
Poor hygiene cause eye infections	0.005	0.032	0.071	0.943	-0.061 - 0.066	0.028	0.053	0.400	0.690	-0.084 - 0.127

*CLTS: Community Led Total sanitation; ODF:Open Defecation Free; HWWS:Hand Washing With Soap, Coeff=Coefficient; Std=Standard; CI=Confidence Interval*



**Table 4: Uni-variate Analysis of association of community knowledge on community led total sanitation and hand-washing facility availability and hand-washing with soap after defecation.**

CLTS and ODF Variable	HWF Available					Washing hands with soap after using a latrine				
	Standardise d Coff (Beta)	Std Error	t-value	p- value	95% CI	Standardise d Coff (Beta)	Std Error	t-value	p- value	95% CI
CLTS is about latrine construction	0.063	0.081	0.769	0.442	-0.096 - 0.221	0.004	0.136	0.044	0.965	-0.261 - 0.273
CLTS is about using a latrine all the time	0.063	0.081	0.769	0.442	-0.096 - 0.221	0.004	0.136	0.044	0.965	-0.261 - 0.273
CLTS aims at attaining ODF status	0.181	0.083	2.139	0.033	0.014 - 0.342	-0.076	0.14	-0.932	0.352	-0.406 - 0.145
Village verified ODF	-0.112	0.065	-1.561	0.119	-0.229 - 0.026	0.109	0.109	1.575	0.116	-0.043 - 0.387
Latrine use prevents diarrhea	-0.030	0.082	-0.394	0.694	-0.193 - 0.128	-0.020	0.137	-0.277	0.782	-0.308 - 0.232
Open defecation spreads worm infestations	0.033	0.093	0.375	0.708	-0.148 - 0.217	-0.014	0.156	-0.171	0.865	-0.333 - 0.280
ODF is also about water protection	-0.020	0.085	-0.237	0.813	-0.186 - 0.146	-0.068	0.142	-0.832	0.406	-0.398 - 0.161
ODF is also about washing hands with soap after defecation	0.004	0.058	0.067	0.947	-0.110 - 0.118	-0.157	0.098	-2.725	0.007	-0.457 - 0.074
HWWS kills germs in hands	-0.140	0.062	-2.218	0.027	-0.261 - 0.016	0.180	0.105	2.946	0.003	0.103 - 0.517
Poor hygiene cause eye infections	0.116	0.066	1.718	0.087	-0.016 - 0.242	-0.167	0.111	-2.554	0.011	-0.500 - 0.065

*CLTS: Community Led Total sanitation; ODF: Open Defecation Free; HWWS: Hand Washing With Soap, Coeff=Coefficient; Std=Standard; CI=Confidence Interval*

**Table 5: Analysis of Variance on CLTS and ODF knowledge with Latrine availability and latrine use**

	ANOVA <sup>a</sup>					ANOVA <sup>a</sup>				
	Latrine Availability					Latrine Use				
	Sum of Squares	Df	Mean Square	F	Sig.	Sum of Squares	df	Mean Square	F	Sig.
Regression	0.465	11	0.042	0.773	0.667 <sup>b</sup>	1.158	11	0.105	0.707	0.733 <sup>b</sup>
Residual	23.099	423	0.055			63.026	423	0.149		
Total	23.563	434				64.184	434			

ANOVA: Analysis of Variance; df: Degrees of Freedom, Sign: Significance

a. Dependent Variable: Latrine available, b. Predictors

**Table 6: Analysis of Variance on CLTS and ODF knowledge with Latrine availability and latrine use.**

	ANOVA <sup>a</sup>					ANOVA <sup>a</sup>				
	HWF Availability					Washing hands with soap after defecation				
	Sum of Squares	Df	Mean Square	F	Sig.	Sum of Squares	df	Mean Square	F	Sig.
Regression	5.778	10	0.578	2.571	0.005 <sup>b</sup>	36.271	10	3.627	5.698	0.000 <sup>b</sup>
Residual	95.506	425	0.225			270.561	425	0.637		
Total	101.284	435				306.833	435			

ANOVA: Analysis of Variance; df: Degrees of Freedom,; Sign: Significance

a. Dependent Variable: HWF availability and Washing Hands with Soap after defecation. b. Predictors

#### 4.5 Community attitude on community Led Total Sanitation on Open Defecation Free Status practices after certification

The majority of respondents strongly agree that having no latrine is shameful (76.0%, n=333). Most also strongly agreed that they are pleased using a latrine (72.4%, n=317). Most respondents also said it is shameful and embarrassing to be seen defecating in the open (81.7%, n=358) and sharing a latrine (63.9%, n=280). On use of a latrine basing on safety and cleanliness, most of the respondents strongly agreed that they use a latrine as it is safe (76.5%, n = 438 ) and clean enough (72.4%, n =317) respectively. All the above had mean scores of between 3.5 – 5.0 indicating a positive attitude towards latrine use (Table 7)

Almost half of the respondents strongly agree that lack of privacy discourages one from using a latrine (49.8%, n = 218) and feel uneasy discussing issues of human excreta respectively(48.4%, n=212). These had mean scores of between 2.5 – 3.4 indicating a neutral attitude towards

latrine use. Overall mean score was 3.73. This is between 3.5 and 5.0 indicating that the respondents had a positive attitude towards latrine use (Table 7)

During focus group discussion, male members said with a happy face that they are always proud to show their latrines and their clean household environment to extension workers, and even other visitors. One member said this:

*“We are now living in a healthy environment with the knowledge gained from CLTS. It has changed our lives. We are benefiting from its fruits. Since our village became ODF, our villages have been clean”*

Another VDC member added that:

*“We are not only constructing toilets, but our homes are now clean. Another female respondent full of pride. Apart from the toilet being clean, we feel safe defecating in a toilet. We feel happy and comfortable with one another since the young ones cannot lough and boo you when found defecating in the open as before”*

**Table 7: Community attitude towards latrine construction and use after ODF certification**

Predictive Variable	Participant Response <i>n</i> = 438 (100%)				Score		Attitude
	Strongly Disagree	Disagree	Agree	Strongly Agree	Total Score	Mean Score	
It is shameful not to have a latrine	1 (0.2%)	1 (0.2%)	103 (23.5%)	333 (76%)	1644	3.75	Positive
It is shameful and embarrassing to be seen defecating in the open	1 (0.2%)	1 (0.2%)	78 (17.8%)	358 (81.7%)	1669	3.81	Positive
It is shameful to use somebody's latrine	1 (0.2%)	9 (2.1%)	148(33.8%)	280 (63.9%)	1583	3.61	Positive
It makes one feel uneasy discussing issues of human excreta	27 (6.1%)	120 (27.4%)	79 (18%)	212 (48.4%)	1352	3.09	Neutral
I am pleased and happy when I use a latrine	1 (0.2%)	3 (3.7%)	117(26.7%)	317 (72.4%)	1626	3.71	Positive
The latrine is clean enough to use	1 (0.2%)	1 (0.2%)	119 (27.2%)	317 (72.4%)	2222	5.07	Positive
Lack of privacy discourages latrine use	45(10.3%)	115 (26.3%)	60 (13.7%)	218 (49.8%)	1327	3.03	Neutral
It is safe when you defecate in a latrine	1 (0.2%)	2 (0.5%)	100 (22.8%)	335 (76.5%)	1645	3.76	Positive
<b>Overall Mean Score</b>					<b>3.73</b>	<b>Positive</b>	

*Likert scale mean score attitude interpretation: 1.0-2.4 (Negative), 2.5-3.4 (Neutral), and 3.5-5.0 (Positive).*

#### **4.6 Association between community attitude of community Led Total Sanitation and Open Defecation Free status practices after certification**

The study was done to determine whether attitude influences latrine construction hand-washing facility construction, latrine use and washing hands with soap. Regression coefficients results show cleanliness of a latrine has a positive significance with latrine use ( $\beta = -0.227$ ,  $p = 0.012$ ) (Table 9), hand washing facility construction ( $\beta = 0.085$ ,  $p = 0.006$ ) (Table 9). Latrine cleanliness has also a significant effect with HWWS after defecation ( $\beta = 0.148$ ,  $p = 0.05$ ) (Table 9). Being shameful discussing human excreta issues has significant relationship of participants attitude with washing hands with soap after defecation ( $\beta = 0.071$ ,  $p = 0.006$ ) (Table 9).

Analysis of Variance regression model show that there is no significant relationship between attitude of participants and latrine construction, latrine use ( $p > 0.05$ ) (Table 10).and after defecation. On hand-washing facility use ( $p > 0.05$ ) (Table 11). Attitude is statistically significant only for hand-washing facility availability ( $F = 2.571$ ,  $p = 0.005$ ). This suggests that the attitude of participants on CLTS and ODF collectively has effect on hand-washing facility availability.

**Table 8: Univariate Analysis of association of community Attitude on Latrine construction and Latrine use after open defecation free status certification**

Independent Variable	Latrine Available					Latrine use				
	Standardised Coeff (Beta)	Std Error	t-value	p-value	95% CI	Standardised Coeff (Beta)	Std Error	t-value	p-value	95% CI
Its shameful not having a latrine	-0.01	0.044	-0.116	0.908	-0.092 - 0.082	-0.062	0.071	-0.739	0.461	-0.193 - 0.087
Its shameful and embarrassing seen Open Defecating	-0.064	0.046	-0.783	0.434	-0.127 - 0.055	0.084	0.074	1.047	0.296	-0.068 - 0.224
Shameful to use somebody's latrine	0.045	0.03	0.654	0.514	-0.040 - 0.080	0.093	0.049	1.359	0.175	-0.03 - 0.162
Its shameful discussing human excreta issues	-0.063	0.022	-0.68	0.497	-0.058 - 0.028	-0.113	0.035	-1.234	0.218	-0.113 - 0.026
Pleased and happy using a latrine	-0.03	0.047	-0.322	0.748	-0.106 - 0.076	0.001	0.075	0.011	0.992	-0.146 - 0.147
Latrine clean enough to use	0.050	0.046	0.91	0.363	-0.048 - 0.131	-0.227	0.073	-2.528	0.012	-0.328 - 0.041
Lack privacy discourages latrine use	0.077	0.019	0.882	0.378	-0.021 - 0.055	0.111	0.031	1.282	0.201	-0.021 - 0.100
Safe when using a latrine	-0.006	0.043	-0.078	0.938	-0.087 - 0.081	0.085	0.068	1.047	0.296	-0.063 - 0.206

Coeff=Coefficient; Std=Standard; CI=Confidence Interval; OR=Odds Ratio

**Table 9: Univariate Analysis of association of community Attitude and hand washing facility construction and hand-washing with soap after defecation.**

Independent Variable	HWF Available					Washing hands with soap after using a latrine				
	Standardise d Coeff (Beta)	Std Error	t-value	p-value	95% CI	Standardised Coeff (Beta)	Std Error	t-value	p-value	95% CI
Its shameful not having a latrine	-0.149	0.088	-1.801	0.072	-0.333-0.015	0.144	0.078	0.999	0.318	-0.139 - 0.428.
Its shameful and embarrassing seen Open Defecating	0.017	0.092	0.21	0.834	-0.162 - 0.201	0.151	0.09	1.206	0.229	-0.115 - 0.478
Shameful to use somebody's latrine	-0.047	0.061	-0.686	0.493	-0.160 - 0.077	0.099	-0.104	-1.635	0.103	-0.355 - 0.033
Its shameful discussing human excreta issues	0.204	0.044	2.257	0.025	0.013 - 0.184	0.071	-0.232	-2.740	0.006	-0.335 - - 0.055
Pleased and happy using a latrine	0.004	0.093	0.042	0.967	-0.178 - 0.186	0.151	-0.143	-1.643	0.101	-0.545 -0.049
Latrine clean enough to use	-0.071	0.091	-0.805	0.422	-0.251 - 0.105	0.148	0.163	1.961	0.05	-0.001 - 0.581
Lack privacy discourages latrine use	-0.052	0.038	-0.603	0.547	-0.098 - 0.052	0.062	-0.111	-1.37	0.171	-0.208 - 0.037
Safe when using a latrine	0.221	0.085	2.744	0.006	0.066 - 0.400	0.139	-0.074	-0.977	0.329	-0.408 - 0.137

Coeff=Coefficient; Std=Standard; CI=Confidence Interval; OR=Odds Ratio

**Table 10: Analysis of variance on association of Attitude and Latrine Availability and Latrine use**  
**Regression summary**  
**ANOVA<sup>a</sup>**

	Latrine Availability					Latrine Use				
	Sum of Squares	df	Mean Square	F	Sig.	Sum of Squares	df	Mean Square	F	Sig.
Regression	0.456	11	0.042	0.773	0.667 <sup>b</sup>	1.158	11	0.105	0.707	0.733 <sup>b</sup>
Residual	23.099	423	0.055			63.026	423	0.149		
Total	23.5634	434				64.184	434			

ANOVA: Analysis of Variance; df: Degrees of Freedom,; Sign: Significance

a. Dependent Variable: Latrine available and Latrine use, b. Predictors

**Table 11: Analysis of variance on association of community attitude with hand-washing facility availability and HWWS after defecation**  
**ANOVA<sup>a</sup>**

	HWF Availability					HWWS after Latrine Use				
	Sum of Squares	Df	Mean Square	F	Sig.	Sum of Squares	df	Mean Square	F	Sig.
Regression	5.778	10	0.578	2.571	0.005 <sup>b</sup>	36.271	10	3.627	5.698	0.000 <sup>b</sup>
Residual	95.506	425	0.225			270.561	425	0.637		
Total	101.284	435				306.883	435			

ANOVA: Analysis of Variance; df: Degrees of Freedom,; Sign: Significance

a. Dependent Variable: HWF available and washing hands with soap after defecation. b. Predictors

## 4.8 Discussion

### 4.8.1 Knowledge of community on Community Led Total sanitation and its impact on Open defecation practices after certification

Knowledge of the community on sanitation plays a greater role in the implementation of CLTS for the attainment and sustenance of open-defecation-free status. The knowledge is detrimental as it helps individuals to understand the importance of constructing and using latrines, constructing hand-washing facilities, and washing hands with soap after using a latrine. The study was pursued to find out whether knowledge about CLTS and ODF help communities to understand the importance of constructing latrines, hand washing facilities, defecate in latrines and wash hands with soap using a latrine. The study shows that respondents have adequate knowledge on CLTS and ODF (Mean Score = 3,7). This is similar to results of a study conducted by Sigler et al (2014) which indicated that respondents had high knowledge on CLTS and ODF after certification.

The majority (99%) know that CLTS aims at attainment of ODF status by constructing latrines, using them and washing hands with soap after defecation. Most respondents (99%) also know that use of latrines and stopping open defecation and washing hands prevent spread of diarrhea diseases, worm infestation and eye infections. These results agree with a study by Wasonga et al., (2014) in Nyakachi, Kisumu County which revealed that sanitation knowledge of CLTS helps in reducing occurrence of cholera and other diarrhea diseases. In a study done in Kenya, the majority of the respondents were in agreement that open defecation may lead to cases of diarrhea cases requiring full implementation of CLTS in areas where OD is common (Musyoki, 2016). Spears et al (2013) also found that communities had knowledge that helminthic soil infections are also as a result of open defecation. On the other hand, the results are contrary to those of a study conducted in Kajiado County in Kenya where herdsmen had the opinion that open defecation does not necessarily spread diarrhea diseases and worm infestations (Bokeoo, 2020).

Multivariate analysis indicate that there is no statistical significance between knowledge of the community on CLTS and ODF and latrine construction ( $p = 0.667$ ) and

latrine use ( $p = 0.733$ ). This indicates that knowledge does not influence latrine construction and use. This concurs with Lopez et al. 2019 which found that people may not defecate in latrines despite having knowledge of CLTS and ODF benefits of sanitation. The community of Balaka were certified ODF by having a latrine, hand washing facility, using a and washing hands after defecation coverage of over 95%. Four years down the line there is reduction in the coverage of latrines, hand-washing facilities latrine use and hand-washing with soap despite having adequate CLTS knowledge. This confirms that indeed knowledge has no effect on sanitation and hygiene coverage in Balaka after CLTS implementation. The reduction in latrine and hand-washing facility is influenced by other factors not necessarily knowledge.

Contrary to this, herdsmen in Tanzania (78.5%) were used to open defecation for having inadequate knowledge that open defecation spreads diarrhea diseases and worm infestations (Bokeoo, 2020). According to Sara and Graham (2014), inadequate knowledge of the community on CLTS and ODF affects construction and use of latrine which is different to the finding of this study. Sayati (2018) and Talinusa et al. (2017) found that knowledge was significantly related to latrine use ( $p = 0.012$ ) and that people with inadequate knowledge on sanitation and hygiene and the importance of having a latrine will not use it.

Remarkably, the study shows a strong relationship between knowledge of communities on ODF and hand-washing facility construction ( $F = 2.349$ ,  $P = 0.008$ ) and washing hands with soap after defecation. ( $F = 5.118$ ,  $P = 0.001$ ). This denotes that knowledge about CLTS and ODF significantly has an influence on hand-washing facility construction and washing hands with soap after defecation. Differing with this is a 2019 study by Lopez et al. which found that people may use hand-washing facilities despite having knowledge of the health benefits of washing hands with soap after defecation. Another study in Masaiti District in Zambia also reported that people in some villages were not washing hands after using a toilet even after being sensitized on the importance of hand washing by Sanitation Action Groups (Kagwa, 2017)

#### **4.8.2 Attitude of community towards Community Led Total sanitation and its impact on Open Defecation Free Status Practices after Certification**

The main dependent variables taken into consideration were latrine ownership, latrine sharing, latrine cleanliness, individual safety and privacy, and discussing human excreta issues. In general, the study results show that the

community in Balaka has a positive attitude towards latrine construction and use (Mean Score 3.73). This is supported by their agreement that it is not shameful to have a latrine, that they are pleased and happy defecating in a latrine. This is influenced by its safety and for being clean. On the other hand, results indicate that some respondents had a neutral attitude towards latrine construction and use (Mean score between 2.5 – 3.4) due to the fact that discussing issues of excreta and lack of privacy discourages individuals from using a latrine. Another element is that of dignity for not being tempted to defecate in the open for being afraid of being jeered by children. FGD results also indicated that those found defecating in the open are booed. Similar results by Celia, (2018) in Nepal and Odagiri et al., (2017) in Indonesia indicated that communities were laughed at when found defecating in the open and felt ashamed and embarrassed.

Most of the respondents feel ashamed not to have a latrine and even sharing a latrine. This is similar to results of a study by Thys et al., (2015) in rural Eastern Zambia which showed that fathers felt ashamed with pit-latrines sharing with their daughters thereby increasing OD chances. Another 2020 study in Ethiopia by Abebe found that sharing brings discomfort (19%) and contributes to open defecation. Respondents also indicated that it was very shameful to be defecating in the bush.

The majority of respondents use a latrine because it provides safety (76.5%,  $n = 335$ ) and for being clean (72.4%  $n = 317$ ). It is this safety and cleanliness that keep people of Balaka have toilets in their households (89%,  $n = 360$ ) and made them continue using them (96%,  $n = 419$ ) which is a precondition for behavior change. Cleanliness makes sanitation facilities more hygienic and increases its use (Obeng et al., 2015). Close to half (49.8%,  $n = 217$ ) of the respondents indicated that lack of privacy discourages use of a latrine. This then influences communities to defecate in the open. A good latrine facility should provide enough privacy for its users. Respondents of a study by Garn et al (2017) found that people preferred defecating in the bush far from households other than using a dilapidated latrine and that it is proper and good to use a latrine with all its walls enclosed for privacy and security. In Rajasthan and Bihar, women are mainly motivated to build and use a latrine for being afraid and feeling embarrassed to be seen naked. A report of a study in East Java in 2014 by O'Connell also confirms that indeed privacy is a key latrine construction and use motivator.

A study in Cambodia indicate that 66% of latrine owners allude to comfort as a key driver for enhancing strong internal thoughts and feelings that motivate them to engage in latrine construction and use which are positive

sanitation behaviour (O'Connell, 2014). This shows that attitude influences latrine construction and defecation behaviour after CLTS implementation and ODF certification though in Balaka, attitude does not influence ODFG certification.

Another half of the respondents (48.4%,  $n = 212$ ) feel not comfortable discussing human excreta related issues with others. Kapatuka in 2013 in his study in Malawi (Mulanje and Lilongwe Districts) and another study in rural Zambia (Harvey, 2011) found similar results that discussing human excreta in the public is not welcome, embarrassing and is totally a private issue. Discussing issues about feces in the public has a negative influence while latrine cleanliness has a positive influence on attitude towards washing hands with soap ( $p > 0.05$ ).

## 5. Conclusion and Recommendations

### 5.1 Conclusion

The communities in Balaka four years after ODF certification have adequate knowledge and positive attitude towards CLTS and ODF. Some households have a negative attitude on ODF for feeling uneasy to discuss human excreta issues with others and lack of privacy provision that make them fail to use latrine and opt for ODF. There is still high coverage of latrine and latrine use but very low hand washing facilities coverage and hand washing with soap after defecation. Knowledge on CLTS and ODF has no influence on latrine construction and use but has an influence on hand washing facility construction and washing hands with soap after defecation. Attitude of community on CLTS and ODF has influence on hand washing facility construction and washing hands with soap after defecation free status ( $p$ -value  $< 0.05$ ) four years after ODF certification in Balaka.

### 5.2 Recommendations

Intensive public health education on hand washing facility and washing hands with soap after defecation is required. This will help to emphasize CLTS and ODF sustainability health benefits so that households adopt and maintain hand-washing with soap as a habit and a priority. Future research in sanitation should focus on health promotion integration with other programs that target household development to ensure behavior change for the sustenance of sanitation practices after ODF status attainment.

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