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Abstract

Purpose: Inadequate sanitation is a major factor that causes diarrhea in school-aged children, this leads to a number of health problems, including stunted growth, diarrheal illness and even death. The main objective of the study was to determine the factors associated with practices towards water, sanitation and hygiene with occurrence of diarrhoea among pupils in schools with a feeding programme in Ganze sub county, Kenya

Methodology: A school-based cross-sectional study design was employed where 24 schools were sampled. 10 pupils were targeted from each school (240). Data was collected through a pre-tested structured questionnaire and keyed-into the SPSS and analysed.

Results: Study findings indicate that majority of the pupils aged between 10 – 14 years were 69.7%, while those aged between 15-18years were 25.5% and the least was aged between 5-9 years old at 5.0%. Majority of the pupils were in class 5-6 forming 48.7% of the responses, followed by classes 7-8 at 46.7% while classes 3-4 at 4.6 %. The study results indicate that 54% of the pupils were female and 46% male. It was noted that there is statistical significance among pupils who had suffered from diarrhea (P>0.005). Gender (p<0.005), training on health related issues at school (P<0.005), as well as schools with Home Grown School Meals Programme (P<0.005) and Knowledge of diseases associated with WASH (χ^2= 108.519, df = 1, P<0.005) had a significance association with diarrhoea occurrence. Toilet usage (χ^2= 2.088, df = 1, P>0.005), availability of water (χ^2= 0.836, df = 2, P>0.005), availability of handwashing facilities (χ^2= 0.141, df = 1, P>0.005) had no significant association with occurrence of diarrhea. Further significance was noted on demographic (β = 0.867, P=.000) behavioural (β = 0.924, P=.000), environmental factors (β = 0.689, P=.000) and diarrhoea occurrence.

Conclusions: Study indicates that environmental, demographic and behavioral factors significantly predict diarrhea occurrence. WASH related diseases, Trainings on WASH and implementation of HGSMP have a positive relationship with occurrence, prevention and control of diarrhea. Control programs should adopt a more comprehensive approach. School and community-based health education is also imperative to significantly reduce the spread and morbidity from diarrhoea.

Key words: *Practice, Diarrhoea, WASH, Prevention, Control, Ganze*

1.0 INTRODUCTION

Background of the Study

Inadequate sanitation can lead to a number of health problems, including stunted growth, diarrheal illness and even death. Equitable access to school sanitation is of particular concern. Data is scarce, but recent estimates suggest that only 45% of schools in low income countries have adequate sanitation facilities (Bartram & Cairncross, 2010).

School health and nutrition programmes (SHN), which include Homegrown School Meals (HGSM), are now widely recognized as significant contributors to the attainment of the Millennium Development Goals in regard to food security, Health and Education for All Homegrown School Meals (HGSM) programme generally aims at providing school meals to children in schools located in food insecure areas like Ganze. Such meals may act as an incentive and mechanism for increased child attendance and attainment in school. Its primary objective is to promote school attendance including gender parity while enhancing cognitive abilities. These effects are more effective when combined with other complementary actions such as water and sanitation programmes, deworming, providing food and/or micronutrients (Gakidou, Cowling, Lozano & Murray,2010). The burden of sanitation related illnesses like diarrhea and jiggers among school going children and their guardians is an important prerequisite for the development of both quick-win and long term solutions. This will help guide outreach programs and improve understanding of other correlates of early childhood development (Annette, 2004).

Globally it is estimated that inadequate water sanitation and hygiene is responsible for 4% of all deaths and 5.7% of the of the total disease burden (Annette, Lorna and Jamie, 2004). In Kenya, 17 million of the country's 40 million inhabitants do not have access to clean drinking water. The most official estimates of access from the Government of Kenya put water supply coverage at 42 percent and sanitation coverage at 31 percent in 2006 (urban and rural areas combined) (Water and Sanitation Programme,2006). Most of the burden of diarrheal diseases, skin conditions and tungiasis infestation can be preventable with improvements in sanitation, water quality such as point of use disinfection. Proper sanitation infrastructure and behaviors at schools can improve attendance and improve educational outcomes, leading to societal impacts on human productivity and dignity. School sanitation is particularly advantageous for girls when appropriate numbers of girls' only latrines are constructed and maintained. Activities at schools also model sanitation technologies and behaviors that are transferred from schools and school children to households and community. Similarly, School Feeding Programmes have been shown to impact positively on enrollment, nutritional status and cognition of school children as well as reduce hunger and improve poverty indicators (World Bank, 2012).

2.0 MATERIALS AND METHODS

Study Site

The study was conducted in the 4 divisions of Ganze Sub County, Kilifi County, namely; Bamba, Ganze, Vitengeni and Jaribuni. The geographical coordinates are 3° 32' 0" South, 39° 41' 0" East. It is located in the North-West Coast of Kenya, and has semiarid vegetation with very

little rainfall in the months of May and August. Ganze has a population of close to 140,000 Citizens and stretches on a 3,000 km^2 surface. The area has a total of 125 primary schools, with 48 primary schools implementing the government led Home Grown School feeding Programme though it has low primary and secondary school enrolment rates

Study Design

This was a cross sectional study adopting quantitative approach. It entailed surveying schools implementing Home Grown School Meals Program and comparing the same variables with schools not implementing Home Grown School Meals Program. Data from the households was also collected around the schools implementing HGSM Programme and those not implementing HGSMP. Data was compared from both arms of the study for children aged between 5-15 years

Study population

The study targeted pupils aged 5-15 years in primary schools in Ganze, Kilifi County. A total of 12 control schools and 12 intervention schools were included. Ten pupils were targeted from each school, totaling to 240 participants. Parents/guardians were paired with the pupils giving rise to a total of 480 study participants. Once enrolled, pupils were followed home for the household survey involving their parents/guardians

Sample size determination

The sample size calculation was based on formula as described by Demidemko 2008 for comparative study [13]. Assuming that the school feeding program would result in a 10% change in all outcomes (Cohen, 1998 for small effect size), 80% power to detect the change, 5% level of precision, 80% response rates, the formula below would result in a sample size of 470.

$$n = \frac{r+1}{\mathrm{r}} \frac{(\bar{p})(1-\bar{p})(Z_{\beta} + Z_{\alpha/2})^2}{(\mathrm{p}_1 - p_2)^2}$$

Where r is the ratio of number of pupils required between the control and intervention sites, assumed to be 1:1. P will be average rates of outcomes set at 50% which is the maximum variation in proportion, Za is the Z score of a normal distribution (1.96) at 0.05 level of precision and Z score at 80% (0.84). P1- p2 is the effect size expected as a result of intervention. An additional 10% accounted for non response, hence the minimum sample size was 480. Estimated sample size for both control (120) and intervention (120) was 240. Parents (240) were paired with the each pupils giving rise to 480 participants.

Sampling Procedure

For ease of data collection, attempt was made to organize the schools randomly until the required sample size was reached. Each school was then stratified according to their class grade that is standard 1-8. Thereafter random sampling was done using class registers as the sampling frame and random numbers generator.

Questionnaire

Before administration, approximately 10% of the 480 questionnaires (48 questionnaires) were pretested in schools from an area neighboring the survey site. For the school based survey; interviewer administered semi-structured questionnaires were developed and used as one of the data collection tools to elicit information on the demographic data including; age, gender and primary level, behavioral, personal hygiene such as washing hands after defecation and before meals, defecation practices that is open defecation or not.

Data Management and Analysis

Once collected, quantitative data was coded and keyed-in in MS-Access which acted as the database Code-books were available for reference. Data security was ensured by creation of back-ups in removable discs and in servers. Access of the data was limited through robust pass-words to only those involved in the survey. Data was exported to Epidata Version 3.1 (EpiData Association) and Statistical Package for Social Sciences (SPSS version 20.0) for analysis. Summary/descriptive statistics was used to describe the data and generate summary tables for each level-factor. Regression method for clustered data or multilevel models was used to adjust for confounding pupil variables such as age, gender and existing health conditions. Multiple regression model was used to assess the effect of intervention controlling for confounding factors. Results were presented in frequency distribution tables, charts and graphs. Differences between the parameters of estimate were deemed statistically significant at $p < 0.05$.

3.0 RESULTS

3.1 Demographic characteristics of the respondents

Findings of the study indicated that majority of the pupils aged between 10 – 14 years were 69.7%, while those aged between 15-18years were 25.5% and the least was aged between 5-9 years old at 5.0%. Majority of the pupils were in class 5-6 forming 48.7% of the responses, followed by classes 7-8 at 46.7% while classes 3-4 at 4.6 %. The study results indicate that 54% of the pupils were female while 46% were male (Table 1).

3.2 WASH Related Practices and Disease Occurrence in Schools

The distribution was 114 (47.9%) for the males and 124 (52.1%) for the females. Gender and disease occurrence were statistically significant at χ^2= 7.979, df = 1, P<0.005. Hand washing was also not associated with disease occurrence with 218 (94.0%) indicating that they wash their hands and 14 (6.0%) reporting that they did not wash their hands at χ^2 = 0.556, df = 1, P>0.05. Frequency for handwashing at 68 (30.1%) washed before feeding, 156 (69.0%) after visiting toilet and 2 (0.9%) others reasons did not have statistical significance at χ^2= 2.098, df = 2, P>0.05 with disease occurrence.

Further cross tabulation for handwashing (χ^2= 0.027, df = 2, P>0.05), friends at school washing hands after visiting the toilet (χ^2 = 0.184, df = 1, P>0.05), Latrine/toilet usage (χ^2=2.088, df = 1, P>0.05), Availability of soap χ^2= 0.401, df = 2, P>0.05) and handwashing with soap (χ^2= 2.219, df = 2, P>0.05) revealed no significant association with disease occurrence. The results on availability of drinking water was 106 (45.7%) for drinking water always being available, 104

(44.8%) sometimes and 22 (9.5%) for water not being available at all. There was however no significance association with availability of water (χ^2= 0.836, df = 2, P>0.05) as well as schools' source of drinking water at χ^2= 3.022, df = 2, P>0.05 (Table 2).

3.3 School Practices towards Diarrhoea occurrence

The number of pupils affected by diarrhea in the last 3 months was at 1 (14.3%) school and in 6 (85.7%) schools, this revealed a significant relationship between pupils affected by diarrhea in the last 3 months and disease occurrence χ^2= 7.000, df = 1, P<0.05. Diarrhea among pupils was 1 (100.0%) for pupils aged 0-5 years. Pupils suffering from diarrhea was 10 (100.0%) for all schools that had experienced death of pupils as a result of diarrhea in the last one month. Action taken when pupils have diarrhea was related to diarrhea among pupils and was 2 (22.2%) for schools that gave ORS and 7 (77.8%) for schools that took the pupils to a health facility/clinic. There was no significant relationship between action taken when pupils have diarrhea and the pupils who suffered from diarrhea at χ^2= 0.321, df = 1, P>0.05.

Cause of diarrhea was cross tabulated to occurrences among pupils and was 1 (10.0%) for schools associating it with rain, 6 (60.0%) for dirty hands, 1 (10.0%) for germs and 2 (20.0%) for poor hygiene. Prevention of diarrhea was related to diarrhea among pupils 8 (80.0%) of schools stated drinking clean water, 1 (10.0%) preparing food properly (cooking, washing) and 1 (10.0%) for latrine use. Causes and prevention had no significant dependency with disease occurrence at χ^2= 0.741, df = 3, P>0.05 and χ^2= 0.278, df = 2, P>0.05 respectively, while training on health related issues had a significance influence at χ^2= 3.938, df = 1, P<0.05 (Table 3).

3.4 School feeding programme and WASH practices

The proportion of Schools without Home Grown School Meals Program were 17 (33.3%), with pupils aged 5-15 with diarrhea occurrence and 34 (66.7%) for those aged above 15 years. There was however no significant association between schools without HGSMP and disease occurrence at χ^2= 0.046, df = 1, P>0.05. Schools with Home Grown School Meals Program was 67 (35.4%) with family members aged 5-15 with diarrhea and 122 (64.6%) for those aged above 15 years. Study findings revealed a significant relationship between schools with HGSMP and disease occurrence at χ^2= 1.455, df = 1, P<0.05.

The main source of water for cooking in school was 5 (83.3%) schools used piped/tap water and 1 (16.7%) used rain water with no significant dependency between the main source of water for cooking in school and disease occurrence at χ^2= 0.240, df = 1, P>0.05 (Table 4).

3.5Inferential Analysis on Diarrhea Occurrences

3.5.1 Relationship between Environmental Factors and Diarrhoea

The study found that environmental factors explained a significant proportion of variance in diarrhoea condition, R^2= .891. This implies that 89.1% of the proportion in diarrhoea condition can be explained by environmental factors in primary schools in Ganze within Kilifi County. Other factors not covered by this study therefore contribute to 11.9%. The study indicated that environmental factors significantly predicted diarrhoea occurrence, β = .944, p = .000; since the p value was less than <.05 set by the study (Table 5).

3.5.2 Relationship between Demographic Characteristics and Diarrhoea

The study found that demographic characteristics explained a significant proportion of variance in diarrhoea occurrence, R^2= .636. This implies that 63.6% of the proportion in diarrhoea occurrence can be explained by demographic characteristics in primary schools in Ganze within Kilifi County. Other factors not covered by this study therefore contribute to 36.4%. The study found that demographic characteristics significantly predicted diarrhoea occurrence, β = .176, p = .000. The study therefore concluded that demographic characteristics significantly influenced diarrhoea occurrence in primary schools in Ganze within Kilifi County (Table 6).

3.5.3 Relationship between Behavioural Factors and Diarrhoea

The study found that behavioural factors explained a significant proportion of variance in diarrhoea occurrence, R^2= .695. This implies that 69.5% of the proportion in diarrhoea occurrence can be explained by behavioural factors in primary schools in Ganze within Kilifi County. Other factors not covered by this study therefore contribute to 30.5%. The study found that behavioural factors significantly predicted diarrhoea occurrence, β = .448, p = .000. The study therefore concluded that behavioural factors significantly influenced diarrhoea occurrence in primary schools in Ganze within Kilifi County (Table 7).

3.6 Multiple Regression

The estimates of the regression coefficients and the p-values for the relationship between the variables of the study are as shown in Table 8. From the findings, water had a coefficient (β = .521, p < .05). Sanitation had coefficients (β = .299, p < .05) while hygiene had coefficients (β = .364, p < .05). From the findings on the moderated model, water had a coefficient (β = .544, p < .05). Sanitation had coefficients (β = .342, p < .05) while hygiene had coefficients (β= .449, p < .05). Testing the influence of the confounding factors, weather and climatic conditions had coefficients (β = .226, p < .05) while household factors had coefficients (β = .229, p < .05).

4.0 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

School and Individual level factors

The current study findings indicate that there was significant relationship between the use of a latrine by pupils and their gender (p = .005), this concurs with a study by Joshua *et al.*, 2014 which revealed some evidence suggesting facility dirtiness may deter girls from use (p = 0.06), but not boys (p = 0.98), these relationships provide insight into the complexity of factors affecting pupil toilet use patterns, potentially leading to a better allocation of resources for school sanitation, and to improved health and educational outcomes for children. Studies by Mathew *et al.*, 2009; Njuguna *et al.*, (2008) indicate that usage of school toilets is associated with their level of cleanliness.

This study indicates no significant relationship between place of hand washing (p= 0.986), when to wash hands (p= 0.350), school providing a place for washing hands (p= 0.798), accessibility of a place for washing hands (p= 0.751) as well as availability of soap (p= 0.818) and diarrhoea occurrence. These findings contradict with a study by Jae-Hyun Park *et al.*, (2010) on hand

washing practice conducted in Korea that noted out of the 942 students who participated there was a 30.3% increase in hand washing an improvement of one carried out one year earlier (Jae-Hyun Park *et al.,* 2010). Targeted interventions aimed at increasing hand washing practice should be encouraged across all communities including schools. Study findings revealed no significant association between availability of water (p = 0.658), use of school source of drinking water (p = 0.221), main source of water for cooking (p= 0.624) in school and diarrhoea occurrence.

Beyond improvements in access to food, school feeding programs also have a positive impact on nutritional status, gender equity, and educational status, each of which contributes to improving overall levels of country and human development (UN, 2013). Extra school activities like provision of micronutrient (p = 0.708) indicated no level of significance. Further study findings indicated no significant relationship between school feeding programme (p= 0.350), type of school feeding programme (p = 0.576) and diarrhoea occurrence though further analysis in the current study indicated a positive relationship between schools implementing Home Grown School Meals Programme and disease occurrence at χ^2= 1.455, df = 1, P<0.005, specifically the Odds Ratio for schools without HGSMP was 1.14 % more likely to suffer from diarrhea.

Study findings indicate that there is a significant relationship between knowledge of diseases associated with water, sanitation and hygiene and those who suffered from diarrhea (p= 0.000). This concurs with a previous study that indicated that in terms of knowledge of water-borne diseases, children had a general awareness that dirty water can cause ill-health. Yet, the exact types of water-borne diseases and transmission pathways were poorly understood, thus confirming previous observations made in South Africa where the schoolchildren from rural schools were reported to have a disparity of knowledge on water-borne diseases (Sibiya *et al.,* 2013). It follows that the provision of adequate resources and long-term behaviour change in children to form a sustained habit of hygienic behaviours such as washing hands with soap, including awareness regarding water-borne disease with its mode of transmission.

Current study findings indicate a significant relationship between training on health related issues at school and those who suffered from diarrhea (χ^2= 3.938, df = 1, P<0.005). The study further revealed a significant relationship between participation in water, sanitation and hygiene programs and disease occurrence (χ^2= 2.339, df = 2, P<0.005). There is evidence that health message-based hygiene promotion efforts alone are not always sufficient to motivate behavior change among adults in developing countries, but it is not known whether this strategy improves hygiene practices among children (Curtis *et al.,* 2011; Biran *et al.,* 2009); an evaluation of an intervention in Kenyan schools found no evidence that teacher trainings and school health club activities improved handwashing behavior (Njuguna *et al.,* 2008).

Diarrhoeal Occurrences among pupils

The current study further indicate that demographic characteristics significantly predicted diarrhoea occurrence (p = .000), this concurs with a study by Manwela *et al.,* 2016 which revealed that a child's risk of diarrhoeal attack is associated with age, water quality and sanitation, parental education and household size. Study findings indicates that there was a significant association between pupils affected by diarrhea (χ^2= 2.098, df = 2, P>0.005) in the last 3 months. As mentioned by Walia *et al.,* 1989 poor socioeconomic status and poor sanitation

were important factors responsible for high diarrhoea morbidity due to ease of transmission of infection (Walia *et al.*,1989) especially with larger households this concurs with the current study that revealed a significant association between age of member (p = 0.015) and those who suffered from diarrhea.

The current study reveal that environmental factors significantly predicted diarrhoea occurrence (p = .000). This concurs with study by Heller *et al.*, 2003 that indicated that effects of improved environmental sanitation conditions and hygiene practices on preventing occurrence of diarrhoea among children under five years included washing and purifying fruits and vegetables; domestic water reservoir conditions; faeces disposal, presence of vectors in the house and flooding in the lot (Heller *et al., 2003*). Though the study further revealed no significant relationship between hand washing and those who suffered from diarrhea (p = 0.456).

The current study further revealed that behavioural factors significantly predicted diarrhoea occurrence (p = .000), this concurs with a study by Curtis,2003 that indicated that effectiveness of interventions is usually measured by changes in behaviours, on the assumption that change in behaviour will usually be reflected in reduced morbidity and mortality (Curtis, 2003). The question of whether health education and hygiene promotion actually leads to reduction in disease burden in the community has always elicited mixed results. A paper on the experience of Bawku West District in Ghana noted that despite many efforts by both government and non-governmental organizations in providing water and sanitation infrastructure, health education and hygiene promotion, little had been achieved in reduction of water and sanitation related diseases or improvement in hygiene behaviours. The function of hygienic behaviour is to prevent the transmission of the agents of infection.

While it is clear that sanitation breaks the transmission cycle of many diseases, the season can have impacts on the sanitation facilities themselves with heavy rains causing pit latrines and sewerage systems to flood and become inoperable and possibly contaminate the environment. Study findings revealed that weather and climatic conditions as well as household factors also significantly influence disease occurrence (p = .000) this concurs with a study by Wu XH *et al.*, (2008) which indicated that the number of acute cases with schistosomiasis japonica was markedly higher in years characterized by floods; on average, 2.8 times more cases were observed when compared to years that the Yangtze River had normal water levels (Wu XH *et al.*, (2008).

Conclusions

The study concluded that there was a positive and significant relationship between the variables of the study; pupils who had suffered from diarrhoea, training on health related issues, schools with Home Grown School Meals Programme, environmental, demographic, behavioural and household factors and diarrhea occurrence. Further significant relationship between weather and climatic conditions as well as household factors and disease occurrence were reported in the study area. Type of School feeding programme, Schools without HGSMP, giving of micronutrients, availability of handwashing facility with soap, availability of drinking water, gender, toilet usage of friends, WASH programmes, main source of water for cooking and sharing of health/hygiene messages revealed no level of significance. These factors still influence practices towards WASH, prevention and control of diarrhea infections. Thus, there is

a great need for a proper health education intervention and community mobilization in order to enhance prevention. Providing efficient health education to people residing in disease endemic areas is imperative for an effective and sustainable control programme in order to save the lives and future of the most vulnerable population in Kenya.

These findings support an urgent need to start an integrated, targeted and effective diarrhoea management and control programme with a mission to move towards the elimination phase. Besides periodic health education i.e handwashing and community mobilization, provision of clean and safe drinking water, introduction of proper sanitation are imperative among these communities and schools in order to curtail the morbidity and mortality caused by diarrhoea. Emergence response during floods should also be used as a mitigation strategy in curbing the spread of diarrhoea.

Recommendations

Schools could be the most effective points of managing and controlling sanitation related diseases like diarrhea among the children in collaboration with community health workers who should do follow ups at household levels. Parents are encouraged to enroll their children in schools implementing HGSMP since occurrences of diarrhea is lower in this schools compared to those schools without HGSMP. Treating other infected family members should also be adopted by the public health authorities in combating diarrhea occurrences and reinfections in these communities. This study recommends a focus on change in practices in the community to complement existing efforts aimed at controlling diarrhea.

Interventions aimed at improving sanitation and hygiene in communities should always include targeted behaviour change interventions -Adopt and upscale community and school based participatory approaches to overcome sanitation and hygiene barriers in resource constrained communities by application of relevant participatory approaches such as CLTS and PHAST. This study found that acquisition of basic education could be improved by addressing and managing diarrhoea in endemic areas. This would improve school attendance, retention and dropout which were found to be low among children who were suffering from Diarrhoea.

The study also found that severe Diarrhoea among the children was likely to cause continued absenteeism from school. School absenteeism on the other hand in most cases may result in low performance in standardized score tests. There is need to develop capacity to improve Diarrhoea management by providing adequate training and infrastructure to community health workers and teachers in charge of health care and hygiene of children in schools to enable then focus on management and treatment of sanitation related illnesses at the onset. Finally, there should be continued and sustained research and surveillance on burden of disease caused by sanitation related illnesses like Diarrhoea.

List of abbreviations

CLTS: Community Led Total Sanitation

ESACIPAC: Eastern and Southern Africa Centre of International Parasite Control

KEMRI: Kenya Medical Research Institute

HGSM: Home Grown School Meal Programme

PHAST: Participatory Hygiene and Sanitation Transformation

SERU: Scientific Ethical Review Committee

SHNP: School health and nutrition programmes

SPSS: Statistical Package for Social Sciences

STLS: School total led sanitation

UN: United Nations

WASH: Water Sanitation and Hygiene

DECLARATIONS

Ethics approval and consent to participate

This study was approved by the KEMRI Ethical Review Committee (SSC/ERC protocol No. (3029). The study used questionnaires uniquely coded with results of each questionnaire being kept in strict confidence. Participating in the study was voluntary and one could withdraw at any point. The purpose of the study and its objectives were explained to local authorities, opinion leaders, headteachers, and community members. Informed consent and assent was obtained from the participating respondents in writing. Parental consent was obtained for participants under 16. Subjects were assured about confidentiality of information obtained from them and personal identifiers were removed from the data set before analysis.

Consent for publish

Not applicable

Availability of data and materials

That all data used in the manuscript is available for sharing; including all relevant raw data, will be freely available to any scientist wishing to use them for non-commercial purposes, without breaching participant confidentiality.

Competing Interests

The authors declare that they have no competing interests.

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This study was self-funded and the author is a PhD student

Authors' contributions

JM- conceived of the study, participated in its design coordination, and helped to draft the manuscript.

JM- participated in the design of the study and helped to draft the manuscript.

SK-participated in the design, coordination and helped to draft the manuscript.

GK-participated in the design, coordination and helped to draft the manuscript. All authors read and approved the final manuscript.

CM- participated in the design, coordination.

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Tables

Table 1: Socio-Demographic Characteristics of Pupils

Distribution by Age (years)		**Frequency**	**Percentage**
5-9		12	5.0
10 -14		167	69.7
15-18		61	25.3
Distribution by Class			
3-4		11	4.6
5-6		117	48.7
7-8		112	46.7
Respondents			
	Male	113	46%
Pupils	Female	126	54%

Table 2: Cross Tabulations on WASH practices in schools

	Gender Male Yes Frequency (%)	 Female No Frequency (%)		χ^2	df	P-value
Occurrence of disease in the school						
Yes	68(47.9)	74 (52.1)		7.979	1	0.005
No	65 (66.3)	33(33.7)				
	Washing Hands					
Yes	131 (94.)	7 (5.1)		0.556	1	0.456
No	87 (92.6)	7 (27.4)				
	Frequency for washing hands					
Yes	Before Feeding 38 (27.7)	After feeding 97(70.8)	Other 2(1.5)	2.098	2	0.350
No	30 (33.7)	59(66.3)	0(0)			
	Place of washing hands at school					
Yes	Tap water 82 (66.7)	Hand Wash Basin 16 (13.0)	Leaky Tins 25(20.3)	0.027	2	0.986
No	54 (66.7	10 (12.3)	17(21.0)			
	Friends Washing Hands in School					
Yes	108 (80.6)	26 (19.4)		0.184	1	0.668
No	72 (78.3)	20 (21.7)				
	Use of Latrine/Toilet					
Yes	131 (94.2)	8(5.8)		2.088	1	0.148
No	81(89.0)	10(11.0)				
	Availability of soap at handwashing station					
Yes	Always 18 (13.0)	Sometime 13(9.4)	Never 107(77.5)	0.401	2	0.818
No	14(14.6)	7(7.3)	75 (78.1)			
	Washing of hands with soap and water after visiting the toilet					
Yes	Always 15 (10.6)	Sometime 20(14.2)	Never 106(75.2)	2.219	2	0.330
No	9(9.3)	8(8.2)	80(82.5)			
	Availability of drinking water in school					
Yes	Always 64 (46.7)	Sometime 62(45.3)	Never 11(8.0)	0.836	2	0.658
No	42(44.2)	42(44.2)	11 (11.6)			
	Use of school water source for drinking					
Yes	Always 113 (85.0)	Sometime 12(9.0)	Never 107(77.5)	3.022	2	0.221
No	69(75.8)	14(15.4)	8(8.8)			

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Table 3: School Practices towards Diarrhoea occurrence

Occurrence of diarrhoea in the school and WASH	School Practices towards Diarrhoea Occurrence				χ^2	df	P-value
	Yes Frequency (%)			No Frequency (%)			
	Number of pupils affected with diarrhea in the last 3 months						
Yes	Yes			No	7.000	1	0.008
	1(100.0)			0(0.0)			
No	0(0.0)			6(100.0)			
	Action Taken when one has diarrhea						
Yes	Give ORS			Go to clinic/health facility	0.321	1	0.571
	1(0.0)			1(100.0)			
No	2(25.0)			6(75.0)			
	Cause of Diarrhea						
Yes	Rain	Dirty Hands	Germs	Poor Hygiene	0.741	3	0.864
	0(0.0)	1(100.0)	0(0.0)	0(0.0)			
No	1(11.1)	5(55.6)	1(11.1)	2(22.2)			
	Prevention of Diarrhea						
Yes	Drink Clean Water	Prepare food Properly	Use of Latrine		0.278	2	0.870
	1(100.0)	0(0.0)	0(0.0)				
No	7(77.8)	1(11.1)	1(11.1)				
	Training on health related issues						
Yes	Yes			No	3.938	1	0.047
	120 (86.3)			19(13.7)			
No	74(76.3)			23(23.7)			

Table 4: Cross Tabulations on School Feeding Programme and WASH

		Implementation of School Feeding Programme		χ^2	df	P-value
Occurrence of diseases in the school and WASH		**Yes Frequency (%)**	**No Frequency (%)**			
	Yes	1(100.0)	0 (0.0)	0.875	1	0.350
	No	3 (50.0)	3(50.0)			
	If Yes, Which Type of feeding					
	Yes	Regular school feeding 0 (0.0)	Home Grown School Meals 1 (100.0)	0.313	1	0.576
	No	1 (25.0)	3 (75.0)			
	What is the main source of water for cooking for pupils in this schools					
	Yes	1 (100.0)	0(0.0)	0.240	1	0.624
	No	4 (80.0)	1(20.0)			
		Age of Pupils suffering from disease				
NO HGSMP	Yes	5-15 years Yes 12(34.3)	Above 15 years No 23(65.7)	0.046	1	0.831
	No	5(31.3)	11(68.8)			
Have HGSMP	Yes	34(31.8)	73(68.2)	1.455	1	0.028
	No	33(40.2)	49(59.8)			

Table 5 :Model Summary and Coefficients for Environmental Factors and Diarrhoea

Model summary	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.944[a]	.891	.890	.191

a. Predictors: (Constant), Environmental Factors

Coefficients Table for Environmental Factors and Diarrhoea		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	1.613	.084		.000
	Environmental Factors	.632	.021	.944	.000

a. Dependent Variable: Diarrhoea Occurrence

Table 6: Model Summary and Coefficients for Demographic Characteristics and Diarrhoea

Model Summary	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.754[a]	.636	.607	.728

a. Predictors: (Constant), Demographic Characteristics

Coefficients Table for Demographic Characteristics		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	4.699	.335		.000
	Demographic Characteristics	.159	.084	.176	.012

a. Dependent Variable: Diarrhoea Occurrence

Table 7: Model Summary and Coefficients tables for Behavioural Factors and Diarrhoea Occurrence

Model Summary	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.848[a]	.731	.695	.677

a. Predictors: (Constant), Behavioural Factors

Coefficients table for behavioural factors		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	1.729	.297		.000
	Behavioural Factors	.472	.081	.448	.000

a. Dependent Variable: Diarrhoea Occurrence

Table 8: Coefficients for the Multiple and Moderated Model

Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	.363	.087		.003
	Water	.532	.040	.521	.011
	Sanitation	.322	.064	.299	.009
	Hygiene	.323	.054	.364	.000

a. Dependent Variable: Disease Condition

Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	.363	.087		.003
	Water	.532	.040	.521	.011
	Sanitation	.322	.064	.299	.009
	Hygiene	.323	.054	.364	.000
2	(Constant)	.376	.089		.000
	Water	.576	.065	.554	.001
	Sanitation	.356	.064	.342	.003
	Hygiene	.452	.057	.449	.000
	Weather and climatic conditions	.275	.034	.226	.001
	Household Factors	.223	.080	.229	.007

a. Dependent Variable: Disease Condition