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Original Research Article

State of sanitation and hygiene of public primary schools in Kakamega municipality, western Kenya

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Faiza Mwatumu Barasa[1]*, Wanjala Christine[4], Shaviya Nathan[4], Barasa Mustafa[4], Sowayi Alubokho George[4], Vincent Aden Odini[1], Johnston Wakhisi[3] and Josphat Otwelo Abwajo[2]

[1]The Department of Epidemiology and Nutrition, Moi University Eldoret Town Campus, Eldoret.
[2] The Department of Environmental Health Moi University Eldoret Town Campus, Eldoret,
[3]The Department of Medical Biochemistry, Moi University Eldoret Town Campus, Eldoret.
[4]The Department of Medical Laboratory Sciences (MLS), Masinde Muliro University of Science and Technology (MMUST), Kakamega, Kenya.

*Corresponding Author
Email: mwafazz@yahoo.com
Tel.: +254728637125

This study assessed the state of sanitation and hygiene in public primary schools in Kakamega Municipality Division. All 25 public primary schools located in Kakamega Municipality Division participated. Descriptive cross-sectional study design was used. Stratified random sampling was used to select 400 pupils between class 4 and 7. Twenty five (25) teachers were purposively sampled. Study tools used were observational checklist and structured questionnaires. Data analysis was performed using SPSS version 21. Descriptive statistics including mean and cross tabulations were used. Pearson's Chi-Square test was used to determine relationships between the variables. Approval by Institutional Research and Ethics Committee of the Moi University and informed consent from all study participants was sought. The results indicated that the state of sanitary facilities in schools was poor, unmaintained and inadequate in almost 50% of schools. This demonstrated that investment in school infrastructure was not accorded due priority. Negative effects on pupil's health were due to inaccessible safe drinking water and inadequate sanitary infrastructure despite pupils demonstrating acceptable levels of knowledge on personal hygiene and sanitation. As a result, pupils suffered from communicable diseases such as diarrhoea, flu and typhoid which could be prevented by improving sanitation in schools. The study concluded that physical infrastructure in schools within the study area were in a deplorable state and inadequate for the pupil population. Gaps were identified in school management of resources and enforcement of school health laws.

Key words: Sanitation, public health, personal hygiene, municipality.

INTRODUCTION

Sanitation and hygiene remains a challenge in many parts of the world. About 50% of the developing world's population (2.5 billion people) lack improved sanitation facilities and over 884 million people still use unsafe drinking water sources (WHO and UNICEF, 2010). This contributes greatly to morbidity and mortality in children. To address this global challenge, efforts have been made towards improving public health in schools by various stakeholders. Globally, the *"Call to Action for WASH in Schools"* campaign was formally launched in 2010. This major initiative involved UNICEF and key partners who called on decision-makers to increase investments in the area of safe water supply and sanitation concerns (JCA, 2010). The ultimate goal was to expand water and sanitation (WASH) programmes in school to improve health, foster learning and enable children to participate as agents of change within their homes and communities. The campaign was structured to strategically focus on efforts and resources into key areas (JCA, 2010).

Kenya has made significant milestones in improving sanitation and hygiene in schools. The enactment of School Health Policy and School Health and Guidelines in 2010 shows the government's commitment in improving Public health in schools. This was done to enable various

stakeholders implement school health programmes based on well-defined regulations and standardised guidelines. It was also aimed at improving the effectiveness and quality of health intervention programmes in schools as stipulated in the National School Health Strategy Implementation Plan of 2011-2015. This meant to improve primary health care in Kenya through the full participatory approach by the school children.

Although policy has been in favour of a comprehensive primary health care (PHC) approach, especially school health, there is a disjuncture between policy enactment and its realisation. Health services continue to be highly focused on curative care at higher levels of the Kenya's health system (WHO, 2008). As a result, prevention of diseases has lagged behind. For example, safe drinking water and sanitation provision has dropped from 49% to 43% in Kenya in recent years (MoH, 2005). Consequently, approximately 80% of outpatient hospital attendance in Kenya is attributed to cases of preventable diseases while 50% are water, sanitation and hygiene related (GoK, 2008). In Kakamega Municipality Division, there is 10% coverage of piped water and over 300 bore holes and yet the common sanitation system is pit latrine being used by about 97% of households (MoPND, 2004). Despite the division having plenty of water resources, use of pit latrines make access to portable water be at 60% due to pollution of underground water system (MoPND, 2004).

A report by UNICEF on Kenya Country Profile points out that water and sanitation facilities in schools are increasingly recognized as fundamental for promoting good hygienic behaviour and children's well-being. However, many schools in Kenya have very poor water and sanitary facilities (UNICEF, 2009). These conditions vary from inappropriate and inadequate sanitary facilities to the outright lack of latrines and safe water for drinking and hygiene. UNICEF (2009) further observes that this situation contributes to absenteeism and the high drop-out rates of pupils especially girls. Lack of sanitation and hygienic facilities in schools has a stronger negative impact on girls than on boys because girls need safe, clean, separate and private sanitation facilities in their schools (UNICEF, 2011). Since girls and boys are affected in different ways by inadequate water, sanitation and hygiene conditions in schools, this may contribute to unequal learning opportunities.

School children make up a large proportion of total national population in Kenya (MoPHS/MoE, 2009). This makes schools the largest and most wide spread of all the social services approximately ten times the size of the health services (AMREF, 2007). The heavy investment in the education sector accelerated reforms such as launch of Free Primary Education in 2003. This occasioned an increase in the enrolment of learners in public schools leading to an influx of over 1.3 million learners in the education system (UNICEF, 2011). The rapid increase strained the hygiene and sanitation facilities in schools, consequently resulted into low standards of sanitation and hygiene in many primary schools all over the country (MoEST, 2006). As a result, only 29% of all schools at both primary and secondary levels have access to clean and safe drinking water and appropriate sanitation facilities (MoEST, 2006). In most primary schools a pit-latrine serves over 100 pupils. Moreover, the quality is often very low in places where the facilities exist (SWASH, 2009). Therefore, incidences of collapsing pit latrines and frequent closure of primary schools by the public health department are frequent experiences (MoPND, 2004).

To ensure proper literacy levels, a clean learning environment is needed and would enable a healthy learner population (GoK, 2008). Over time, the population of Kakamega Municipality has expanded without the equivalent improvement or upgrading of the existing sanitation facilities in public schools. Most research on sanitation in schools has also been done on aspects of latrine and water. But sanitation of other facilities like classrooms, urinals, kitchens, and physical environment has not been adequately addressed. Therefore, there was need for updated in-depth information on sanitation and hygiene in schools in all aspects. This data can be used for development of indicators for monitoring sanitation and hygiene in primary schools. Gaps identified in the school health system and would inform policy and decision makers on appropriate mitigations or interventions to improve public health in schools. This will foster a healthy learning environment and improve performance in public primary schools.

MATERIALS AND METHODS

Study Area

The study was carried out in Kakamega Municipality Division in Kakamega County in October 2013. According to the Kenya National Population and Housing Census, Kakamega Municipality Division had a population of 333, 329 (GoK, 2009). The town's annual population growth rate is at 2.12% and population density of 515 people per Km^2 (GoK, 2009). The age distribution is as follows: 0-14 years (46.6%), 15-64 years (40.7%), 65+years (13.6%) (GoK, 2009). This implies that almost half of the population comprises school going children at primary school level.

Kakamega Municipality receives treated water from Savona treatment plant which is managed by the Western Water Company Services (WWSC). The plant was constructed about 30 years ago when the demand for the same was low. Liquid waste management is also carried out by the WWSC. About a third of Kakamega Municipality is on sewer (MoPND, 2004). Over the years, the town has expanded and the population increased implying many areas are not served by this essential service. Consequently, there is rampant use of conservancy system especially pit-latrines within the Municipality. This is not an appropriate option due to its potential to contaminate underground water supply.

Study Population

The study population comprised 25 public primary schools within Kakamega Municipality. Students and teachers from the schools were also part of the study.

Study Design

A descriptive cross-sectional study design was used.

Sample Size Determination

The sample size of pupils was calculated from an estimated study population of over 10,000 pupils. The sample size (n) was determined using 95% confidence interval population parameter of 50% and a statistical error of 5%.
The Fishers formula was used as shown below:

$$n = \frac{Z^2 \hat{p}(1-\hat{p})}{e^2}$$

Where: **Z** is confidence interval, **p** is the proportion of pupils in schools with improved sanitation, **1-p** is the proportion of pupils in schools without improved sanitation, **e** is the acceptable sampling error and **n** is the desired sample size

$$\text{Sample size} = \frac{1.96^2 * 0.5(1-0.5)}{0.05^2} = 384.16$$

The total sample size of pupils was adjusted upwards to 400 to account for non-response.

Sampling Techniques

All the 25 schools within Kakamega Municipality were included in the study. Stratified random sampling was used to select the pupils from class four to class seven. Classes from which the pupils were picked represent a stratum where the appropriate number of pupils was selected randomly. They were then interviewed on various practices of hygiene and sanitation. The number of students was divided equally with in the 25 schools. That meant a minimum of 16 pupils from each school were interviewed. This brought the sample size to 400 pupils. All the interviewed pupils were of the same age group. Purposive sampling was used to select head teachers.

Data collection and storage

Data was gathered with the aid of check list and questionnaires. For every school, closed ended interviewer administered questionnaires were administered to the pupils. The English language used was simple at the level of the learners. Since students were exposed to the English language from class one, there was no need for translation.
Data from teachers was sourced by an open ended teacher's questionnaire to allow for a broader and in depth assessment of the management issues as far as school public health is concerned. Additionally, data from schools was gathered by observation using a check list. Structures whose hygienic standards were studied in the proposed learning institutions include the following; classrooms, administrative buildings and offices, kitchen and ablution facilities.

Ethical considerations

Approval from Institutional Research and Ethics Committee (IREC), an ethics and research body in Moi University Eldoret, Kenya, was sought. Ethical approval number 0001006. The following ethical issues were put into consideration:

a. Participation was entirely voluntary
b. Persons would withdraw from participation in this study at any time they felt like without being penalized
c. No physical risk or physical harm was incurred by obliging to participate in the study.
d. The rights and dignity of all participants was protected and respected. All information was treated with utmost confidentiality.

Official permit to conduct the study was sought from the relevant Area Education Officer's (AEO) office and school administration officials.

Informed consent from all study participants was sought. A request form was read and signed by the head teachers.

Since there exists a dynamic pupil-teacher relationship, assent form was read out loud to pupils before the interviews began and were signed by the head teacher.

Data analysis

Data analysis was performed using Statistical Package for Social Sciences (SPSS Version. 21.0 Inc., 444 N. Michigan Ave. Chicago Illinois). Descriptive statistics including mean, frequency distributions and cross tabulations were used. Categorical data was then subjected to inferential statistics where Pearson's' Chi Square test was used to determine relationships between the variables and the predicted estimates. P values of 0.05 or less were considered to be significant. The findings of the study were then presented using graphs, charts and narrative text. Finally, propositions and conclusions were made based on the apparent patterns or relationships within the data.

RESULTS

Social demographic characteristics of the respondents

The mean age of pupils sampled was 12.8 years. The majority of pupils (83.6%) were between the ages of 10 to 15 years. A Chi Square test of independence conducted on the data showed that there was a significant ($P<0.05$) variation between responses on age distribution. Pupils in

Table 1.Condition of the classrooms

Condition observed	Adequate/ Present	Inadequate/Absent	P value
Ventilation through windows	90.9%	9.1%	P<0.05
Natural lighting	92%	8%	P<0.05
Artificial lighting (electricity)	54.5%	45.5%	P>0.05
Cleanliness of floor	45.5%	54.5%	P>0.05
Cracks/holes on the floors	59.1%	40.9%	P>0.05
Cleanliness of walls	36.4%	63.6%	P>0.05
Fire extinguisher	0%	100%	P<0.05

Table 2. Condition of Latrines in Schools

Condition observed	Adequate	Inadequate	P value
Ventilation tube	40.91%	59.09%	P<0.05
Latrine doors	36.36%	63.64%	P<0.05
Presence of flies in latrines	68,18%(absent)	31.82%(present)	P>0.05
Latrine floor (chipped)	54.55%	45.45%	P<0.05

class four to seven were included in the study. There was no significant variation in the classes sampled (P>0.05).Both male and female pupils had an equal chance of participating in the study. There was no significant variation (P>0.05) in the distribution of gender of the respondents. The average number of students in each class was 48. Only one school had less than 30 pupils in a class. The conditions observed in classroom are as shown in Table 1.

There was no significant association (P>0.05) in the cleanliness of classroom floors and the presence of cracks on the floor.

Wetness on the latrine floors and presence of faecal matter was found in significant number of latrines (P<0.05). A significant association between presence of flies in the latrine and condition of the ventilation tube was observed (P<0.05). Latrine floors that were in bad condition (chipped) also had big aperture size. A chi-square test indicated a significant association (P<0.05). Sources of water in schools were found to be correlated with the frequency of washing of toilets (R<0).

Most schools did not provide urinal pits for boys, 54.6%. Those that had urinal pits, 36.4% had one unit (Table 2).

Factors that affect sanitation and hygiene

The total numbers of boys enrolled was compared with the number of doors of pit latrines provided for boys in each school. The overall ratio was 1 door of pit latrine to 39 boys. When the total enrolment for girls was compared to the number of doors of latrines, the overall ratio was 1:36. The highest ratio was 1 door to 113 girls. Lack of funds was reported as the major challenge experienced by 47.4% of the schools in provision of sanitary facilities for their big populations in schools.

Sixty three per cent (63.4%) of schools that had no health programmes still had no plans to introduce health programmes at all. The vast majority 90% of schools reported having been visited by public health officers. Forty four per cent (44.4%) of the schools were visited on termly basis during the school sessions. The activities carried out by the public health officers were sanitary inspection in 47.4% of the schools, distribution of deworming drugs in 36.8% of the schools and immunization in 5.3% of the schools. The majority of teachers (63.2%) reported being aware of the National School Health Policy. However, a copy of the National School Health Policy was available in 42.1% of the schools.

Thirty eight per cent (36.3%) of schools source their water from piped water system while a significant number - 22.7% - sourced their water from the nearby streams. The presence of storage tanks was compared to the main water sources in schools and were not correlated, Pearson's R=0.352. Most schools that had tanks had piped water as their main source of water.

Twenty seven point four per cent 27.4% of buildings in schools had gutters on all their roofs, 63.6% of them had gutters in some but not all the roofs and 9% did not have gutters at all. The condition of existing gutters was assessed and 36.4% of them were in good condition. Condition of drinking water containers provided for pupils is shown in Table 3

Thirty four point eight per cent 34.8% of schools sourced their water from municipal water supply. Sixty seven per cent (60.7%) of the pupils said that they fetch water outside the school. Chi-square test conducted showed a significant of P<0.05. Twelve point three per cent 12.3% of water sources were thought to be far.

Hand washing facilities near the latrine were provided in 27.3% of schools. A significant (P<0.05) number of schools did not provide essential supplies such as water, taps and soap. Water was provided in 9.1% of hand washing facilities and taps in 13.6% of hand washing facilities. No school provided tissue paper. The conditions observed to

Table 3. Condition of Drinking Water Containers

Condition observed	Present	Absent	P value
Availability of drinking water storage container	54.5%	45.5%	P<0.05
Availability of tap	58.3%	41.7%	P<0.05
Availability of a lid	58.3%	41.7%	P<0.05
Availability of water	52%	49%	P<0.05

Table 4. Environmental Sanitation

Condition observed	Present	Absent	P value
Perimeter fence	86.4%	13.6%	P<0.05
Clean school compound	82%	18%	P<0.05
Compost pit	41%	59%	P<0.05
Surface drainage	86%	14%	P<0.05

assess environmental sanitation of schools are presented in Table 4.

A total 21 food handlers were found in schools. Ninety point five (90.5 %) of them lacked medical examination certificates, while 66.7% did not have protective clothing. Pearson's correlation indicated that there was a significant association in food handlers with medical certificates and those without protective clothing *R*=0.684. Chi square test showed that a significant number of food handlers did not have medical certificates P<0.05.

The knowledge and practices of the pupils towards sanitation and hygiene

Fifty nine point one per cent (59.1%) pupils stated that boiling was a method of making water safe for drinking. A significant 50% (P<0.05) number of pupils mentioned typhoid as a disease caused by use of dirty water and 0.95% said they did not know of any disease caused by use of dirty water. Seventy two point seven per cent 72.7% (P=0.000) of pupils in the study said that crowded rooms could expose one to diseases. While 88.4% (P=0.000) indicated that stagnant water could expose one to disease. All pupils knew that dirty hands exposed one to diseases. Another 7.7% (P<0.05) did not know that fly infestation could also expose one to diseases. Seventy eight point nine per cent (78.9%) knew that open defecation could expose one to diseases (P<0.05).

Fifty one point seven per cent (51.7%) P<0.05 of pupils would wash hands with soap if provided. A significant number of pupils 74.1%, (P<0.05) always washed their hands before handling food, A significant number of pupils (P<0.05) always washed their hands after visiting the toilet, 69.4%.

Common diseases related to poor sanitation and hygiene

A significant number of pupils had suffered from cough, and flu (P<0.05). Skin infection contributed to significant illness of pupils, (P<0.05). Injuries were reported by 1.4% of pupils. Most pupils who reported that they always washed their hand still suffered from diarrhoeal diseases.

Malaria resulted in 47.2% of absenteeism. It was the most significant cause of absenteeism (P<0.05). Respiratory infections caused 14.6% of absenteeism due to illness. Stomach ache and typhoid resulted in 13.58% and 10.42% of absenteeism due to illness respectively.

DISCUSSION

Appropriate hygiene and sanitary facilities would attract more pupils to schools especially girls who have unique needs. It would also foster a healthy learning environment and help reduce cases of diarrhoeal diseases. It is for this reason that this research sort to assess the state of sanitation, hygiene and related diseases in public primary schools.

The mean age of pupils sampled was 12.6 years. Eighty three per cent (83.6%) were between the ages of 10 to 15 years. There was no significant variation in the distribution of class and gender of the pupils sampled. This demonstrated that the sample was well randomised. The ratio of pupils to classroom was 1:48. It meets the recommended standards of 1:50 (GoK, 2013). However, there were a few schools with higher ratio of as 1:83, especially in the peri-urban location of the town.

Standard of cleanliness of the facilities

School buildings and grounds must be designed, constructed and maintained to be accessible and free of hazards, in order to promote learning and school engagement (RIDE, 2014). Since pupils spend much of school day indoors, adequate lighting and fresh air should be provided in classrooms. In this study, most classrooms were adequately lit by natural light although a few had artificial lighting (electricity). It shows that lighting did not interfere with pupils' learning process. Classes observed

had well designed windows that provided adequate ventilation. There were some instances of congestion in classes in some schools that had pupils to classroom ratio of more than 1:50. This could impact negatively on the quality of indoor air. The congested environment in classes could lead to pollution of air that could result into an increase in cases of respiratory diseases. Over half (55%) of the classroom floors observed were dirty. A significant percentage of the floors (59.1%) had cracks and/or pot holes. This was attributable to the high population of pupils in classrooms that might have caused a high rate of wear and tear. Also, poor workmanship during construction may have contributed to the occurrence of cracks. However, classrooms with dirty floors did not necessarily have cracks on the floor. There was an association between the cleanliness of classroom floors and water supply. It was observed that schools that had piped water and rain water as main water sources had clean classroom floors while those with boreholes had dirty classroom floors. It meant that water availability was a contributory factor in the cleanliness of classrooms. Unhygienic conditions in classrooms such as dirty floors and cracks and holes on the floors are health risks to the pupils. Dirty floors are a source of dust particles which increase with overcrowding in the classroom. Such conditions put the pupils in danger of respiratory diseases. For instance, it was noted that respiratory diseases caused a significant amount of illness in pupils. The holes and cracks may serve as jigger hide out. It may also result in falling of pupils leading to injuries. Injury caused illness in 1.4% of the pupils.

Latrines

Human excreta are the biggest source of disease-causing organisms including parasites, bacteria, and viruses (UN, 2007). The disposal of the same is of paramount public health importance. All the schools under study used pit latrines as a method of excreta disposal. Urinal pits were found in 46.4% of the schools. Most of the pit latrines were not functional. About, 59.1% of the latrines had faulty ventilation tubes creating a suitable environment for the presence of flies in 31.8% of latrines. Forty five per cent (45.5%) of latrines had chipped floors. Chipped floors often resulted in increased apertures size which scared younger users. Latrines in the schools did not provide the needed privacy to the users. Sixty three point six per cent (63.6%) of latrines had faulty doors and users were exposed from outside denying them the required privacy. There was a correlation between the condition of doors and contamination of the floor with faecal matter. This indicated that lack of privacy contributed to poor use of latrines. A study in Nakuru Municipality in Kenya also found that pit latrines in primary schools were dysfunctional and denied pupils the privacy needed (Gachieya & Mutua, 2009). Thirty per cent (30%) of pupils said that their latrines were clean. Although the latrines were cleaned daily, they were found in a dirty state during the study. Most of them were contaminated by faecal matter. There was also a significant correlation between faecal matter and wetness on the latrine floor. This suggested improper use and not frequency of cleaning resulted in dirty latrines.

Physical environment

Children's behavioural patterns place them at risk of exposure to environmental threats that adults may not face (Barrett, 2012). They interact with the physical environment of their schools; both consciously and unconsciously hence are at risk of different environmental health risks (Jessica, 2006). WHO estimates that between 25% and 33% of the global burden of diseases can be attributed to environmental risk factors. About 40% of the total burden of disease due to environmental risks falls on children under the age of five years (WHO, 2014). Since children spend much of their daily activities within school environment during critical developmental stages, it is crucial that the same environment be kept clean. Most schools, 82% had clean compounds while 41% of the schools had compost pits. These pits were all filled up and resulted in a pile of solid waste in the school compound indicating poor solid waste management in schools. Since children lack experience to determine risks associated with their behaviours, such the presence waste posed health risks to them. These behaviours include playing with waste, placing their fingers and other objects in the mouth and not washing hands before eating and after visiting the latrine. Preventing childhood exposure to environmental hazards may prevent injuries and many illnesses, such as respiratory infections and diarrhoeal diseases.

Perimeter fence were available in 86.4% of the schools. A fence in a school helps stop animals from defecating in areas where children play as well as keep pupils safe from outside dangers. It prevents them from wondering away from the safety of school environment (OESE, 2000). Most schools had good surface drainage (86%) and water puddles were not found in most school compounds. This notwithstanding, most schools provided ambient physical environment for the pupils.

Factors that affect sanitation and hygiene

Success in eliminating faecal material from the school environment depends on latrines being conveniently located, clean, odour-free, private, adequate and well-maintained (UNICEF/IRC, 2005). It was found that the overall ratio of latrines provided to total boys enrolled was 1:39 and 1:31 for girls. While most of the schools were compliant with the recommended standard of 1:30 for boys and 1:25 for girls, high ratios of 1:123 for boys and 1:113 for girls were recorded. Such was evident in schools where no health programmes were being implemented and particularly no sanitation programme in place. This meant that the problem of inadequate latrines could persist for a longer time. The pressure on the few available sanitation facilities was evidenced by the cleanliness of latrines and

their wear and tear. A similar study in Nakuru, Kenya, revealed that the major problem in school sanitation was the high pupil/toilet ratio (Gachieya and Mutua, 2009). Mbula (2014) also found that the availability of adequate sanitation facilities had implications on good hygiene practices in schools indicated by proper use of toilets.

Studies have suggested that hand washing can prevent 47% of diarrhoeal infections and 30% of acute respiratory infections (Jessica, 2006). It has also been established that lack of resources, such as soap and water, contribute to low practice of hand washing in school children (Aseefa and Kumie, 2014). Some pupils may also forget to wash hands when the location of hand washing facilities away from latrines (Aseefa and Kumie, 2014). It was established that hand washing facilities were found near the latrine in 27.3% of the schools.

However, no school provided the pupils with soap for hand washing, 13.6% of hand washing facilities had taps while only 9.1% of them had water. Consequently, hand washing after visiting the toilet was not practiced. Therefore, was there was increased risk of diarrhoeal diseases transmitted to pupils while at school due to poor hygiene. This was evidenced by 10.4% of pupils reported to have been sick with typhoid. A similar study in Nakuru Municipality also found that hand washing facilities in primary schools were inadequate (Gachieya and Mutua, 2009). WHO estimates that each year, nearly two million children under the age of five die of diarrhoeal diseases caused by unsafe water supplies, sanitation, and hygiene (WHO, 2014).

Drinking water should be safe and clean. According to the NSHG, schools should provide separate drinking water facilities to ensure drinking water is safe (MoPHS/MoE, 2009). About 45.5% of the schools in this study did not provide separate drinking water points for their pupils. A significant number of drinking water storage containers did not have a functioning tap (41.7%), lids (41.7%) and water (49%). After installation, most were left unused and/or unmaintained. The Kenya water report also observes this scenario in schools (Min06). In about 38.1% schools that sourced water from piped water system within the division, pupils probably had access to treated safe water. However, 23.81% of pupils always sourced water from nearby streams. Sixty point seven per cent (60.7%) of the pupils said that they sometimes fetched water from outside the school from nearby streams. This implied that some schools with municipal water supply still sourced water from outside the school. Hence, pupils in such schools were still exposed to unsafe water as safety of such sources could not be assured. Consequently, typhoid disease was prevalent among pupils.

Water conservation is one of the methods of ensuring adequate water supply in schools. Nonetheless, planners prefer the exploitation of groundwater for the installation of hand pumps or piped water-supply schemes (UNICEF/IRC, 2005). This approach of water supply is often expensive for some communities. Since it was established that schools lacked funds to improve sanitation, harvesting rainwater would provide cheap drinking water to school children (Casey, 2012). There is a huge potential in water conservation in schools due to the large roof area provided by buildings. Rain water harvesting could meet their water demands and reduce the costs of water in schools. A study by Casey 2012 in western Uganda, found that the potential of rain water harvested in schools was of adequate amount and could lower the cost of water supply (Casey, 2012). The findings of this study showed that, 52.4% of schools had water tanks, 14.3% of them harvested rain water while 38.1% of schools stored piped water. This implied that although water storage tanks were available in schools, they were often not used for water conservation.

The Kenya water development report (2006) is consistent with these findings that water conservation measures are generally not practised in schools and that pupils fetch and ferry water to school for drinking and washing from nearby water systems (UN-Water, 2006). To reduce the resultant strain on pupils, rain water could provide a cheaper source of water during the dry season. Since Kakamega Municipality receives an average of 2500ml of rain per annum, rain water harvesting would go a long way in reducing the cost of water for schools (MoPND, 2004). The Kenya water supply report, (2006) also indicates that water systems in many schools are not functional. Broken down water pumps and leaking storage tanks is a common problem experienced in most schools (UN-Water, 2006). In spite of these shortcomings, all bore holes in schools under study were protected and hand pumps installed. It was encouraging to note that all tanks were in a functional state.

Food handlers should be free from communicable diseases. The Food, Drugs and Chemical Substances Act Cap 254 laws of Kenya require that all food handlers should undergo medical examination, vaccinated appropriately and wear protective clothing before handling food for public consumption. Ninety per cent (90.5 %) of food handlers in schools studied did not have medical certificates whereas 66.7% of them lacked protective clothing. This implied that there was risk of contamination of food during handling and preparation by uncertified personnel. It meant that there was a likelihood of an occurrence of food borne illnesses, especially typhoid. Typhoid was found to cause significant illnesses among the pupils sampled. It also has been estimated that about 97% of food poisoning comes from improper food handling and 80% of the poisoning originates from food prepared in businesses or institutions (Diet.com, 2014).These findings identifies gaps in the compliance with the National School Health Guidelines which stipulates that catering staff must be medically examined and vaccinated at the beginning of each term. There seemed to be a laxity in the enforcement of guidelines and regulations on the food handling and preparation. Supervision of the schools by the public health officers was not satisfactory.

It is the duty and mandate of the health officials to ensure that design and construction of school facilities is appropriate and acceptable. This should be done through

frequent inspection of the schools. Whereas most schools were visited by public health officers, 10% of them where not visited. The schools that were visited on termly basis were 44.4% of the total. This was consistent with the National School Health Guidelines (NSHG) which requires that public health officers visit schools on termly basis (MoPHS/MoE, 2009). The main activity for the school visits was sanitary inspection and 47.4% of the schools were visited and inspected accordingly. It is important that the sanitary inspection recommendations be enforced as outlined in the NSHG. During the study period, most facilities were found in deplorable state. It was therefore assumed that the recommendations by public health officers were not implemented or no follow-ups were made. Most teachers (63.2%) were aware of the National School Health Policy. However, a copy was available in 42.1% of the schools. These implied that teachers were unaware of the public health regulation s for schools.

The knowledge, and practices of the pupils towards sanitation and hygiene

Knowing about the causes of disease helps in reducing disease burden. It helps ensure the optimal use of safe water supply and sanitation facilities and practising good hygiene is what makes a significant impact (JCA, 2010). In this study, most pupils were aware of the importance of good personal hygiene and environmental hygiene practices as well as related diseases. Here, 46.9% of pupils knowledgeable about the importance of good oral hygiene. Fifty per cent (50%) of pupils mentioned typhoid as a disease transmitted by use of dirty water. These findings indicate that the pupils were knowledgeable on sanitation issues in schools. Teachers also reported that health education on sanitation and hygiene was the main measure taken to improve sanitation in schools. Most pupils mentioned that boiling water is a method of making water safe for drinking. It was established that knowledge of pupils on sanitation was adequate.

However, education alone does not necessarily result in improved health (UNICEF/WHO, 2009). Application of knowledge and the availability of resources are essential to ensure proper practice. The study revealed that 51.7% would wash hands with soap if provided. Since no school had provided soap for washing hands, it goes to show pupils would wash hands with soap. Similarly 74.2% of the pupils wash hands before handling food and 69.4% always washed their hands after visiting the latrine. Although children did not generally practice hand-washing due to lack of facilities, they knew about health problems associated with not washing their hands as stated earlier. The findings agree with a study conducted in Uganda indicating that lack of hygiene enabling facilities at schools and homes did not allow children to practice the hygiene knowledge they had (Jessica, 2006).

Common diseases related to poor sanitation and hygiene

Many organisms spread through contaminated food and water particularly those that are dependent on the faecal-oral route (AMREF, 2007). Diarrhoeal diseases, the second most common global illness affecting young children and a major cause of death in lower income countries (UN, 2007), are closely linked with poor sanitation, poor hygiene, and lack of access to safe and sufficient supplies of water and food. Diarrhoeal diseases and typhoid were also found to cause significant illnesses among pupils in this study at 13.7% and 10.4% respectively. These diseases are linked to poor hygiene both in and out of the school (UNICEF/IRC, 1998). It was established that pupils were exposed to unsanitary conditions that resulted in poor hygiene. The unsanitary conditions in most schools therefore, contributed to the prevalence of diarrhoeal diseases.

Respiratory infections are the most common among all diseases in children, and pneumonia is the primary cause of childhood mortality worldwide (UN, 2007). Under favourable conditions, schools are known to offer a point of transmission and outbreaks (Sphere Project, 2014). Respiratory infections caused 14.6% illnesses among the pupils in the study. Indoor and outdoor air pollution may be blamed for as much as 60% of the global burden of disease brought about by respiratory infections (UNICEF/IRC, 2005). Although most classrooms provided adequate ventilation, congestion in classrooms was observed in some schools. These compromised the quality of air in such classes and contributed in the prevalence of respiratory illnesses in pupils.

Other diseases that contributed to ill health of the pupils included, skin infection. Jiggers were reported by teachers to be a major sanitation problem in 42.9% of the schools. Falls and injuries within the school grounds occur as a result of poorly maintained physical facilities or poor construction management. It was established that injuries caused 1.4% of absenteeism among pupils. These diseases are also associated with poor hygiene and sanitation.

Malaria, the most deadly of mosquito-transmitted diseases, kills over one million people each year. The majority of these deaths occur in African children. In endemic areas, 60% of all school children may suffer from malaria (UN, 2007). Malaria was found to be the most common cause of illness in 47.2% of pupils. This was because Kakamega is an area of intense endemic malaria transmission (Lutomia, 2006).

Conclusions

The study made the following conclusions;

The standard of cleanliness of classrooms, kitchens, physical environment and sanitary facilities in schools was low. Most facilities were in need of repair and dirty. Fifty nine per cent (59%) of the class floors were chipped. About

60% of latrines were faulty resulting in poor usage by pupils. All schools kitchens did not meet the minimum standards of design, construction and safety.

Factors that affect sanitation and hygiene in schools were as follows: inadequate sanitary facilities (59.9%), inadequate funds (47.4%), and poor compliance to school health guidelines.

Pupils were knowledgeable as regards to sanitation and hygiene. Inadequate provision of the facilities in their schools adversely affected the hygienic practices.

The common diseases that are associated with poor hygiene and sanitation were: diarrhoea diseases, 13.9%, respiratory infections, 14.6% and typhoid 10.4%. Malaria caused highest of absenteeism in schools (47.2%).

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REFERENCES

AMREF. (2007). Communicable Disesases 3rd Edition: rural health series. AMREF KENYA.

Aseefa M, Kumie A (2014). Assessment of factors influencing hygienebehaviour among school children in Mereb-Leke District, Northern Ethiopia: a cross-sectional study. BMC Public Health, pp.1-8.

Barrett YZ (2012). Study proves class room design really does matter. Retrieved 08 2014, 7, from University of Salford Manchester: www.salford.ac.uk/news/study-proves-classroom-design-really-does matter

Casey CM (2012). An assessment of water and sanitation infrastructure at primary scholls in Rakai district, Uganda.

Diet.com. (2014). Food Poisoning. Retrieved 08 05, 2014, from diet.com: www.diet.com/g/food-poisoning

Gachieya RM, Mutua BM (2009). Sanitation challenges in learning institutions: The case of Nakuru Municipality, Kenya. 34th WEDC International conference, Water, sanitation and hygine: sustainable Development and Multisectoral Approaches, (p. reviewed paper 262). Addis Ababa, Ethiopia.

GoK. (2008). First Medium Term Plan 2008-2012: vision 2030. Nairobi: Govnment printers.

GoK. (2009). Kakamega Central District Development Plan 2008-2012. Ministry of State and National Resources.

GoK. (2013, january 14). Basic Education Act (no 14 of 2013). Kenya: Parliament of Kenya.

JCA. (2010). raising clean hands advancing learning , health and participation through WASH in schools.

Jessica J (2006). Sanitation and Hygiene in primary schools in Uganda. Retrieved 10 17, 14, from http://www.chdc.mak.ac.ug/publications/Jitta%20Jessica%202006%20Sanitation%20and%20Hygiene%20in%20primary%20schools%20in%20Uganda.pdf

Lutomia SL (2006). Handling problems facing youth in learning institutions. Nairobi, Kenya: Uzima publishing house.

Mbula MA (2014). Access to improved sanitation: implication for sustainable implementation of hygine practices in secondary schools in Machakos county. Kenya European Scientific Journal.

MoEST. (2006). Kenya Education Sector Support report. Delivering quality and training to all Kenyans. http://planipolis.iiep.unesco.org/upload/Kenya/Kenya KESSP FINAL 2005.pdf.

MoH. (2005). National Environmental Sanitation and Hygiene Policy.

MoPHS/MoE. (2009). National school health guidelines.

MoPHS/MoE. (2009). National school health policy.

MoPND. (2004). Kakamega District Monitoring and Evaluation Report.

Muindi M. (2009). faoctors affecting sustainability of free primary education in public schools in Central division, Machakos District Kenya. Retrieved 07 31, 2014, from Digital Repository: http://erepository.uonbi.ac.ke:8080/handle/123456789/5300

OESE. (2000). Impact of Inadequate school facilities on student learning. Retrieved 08 07, 2014, from OESE Archived information: www2.ed.gov/offices/OESE/archives/inits/construction/impact2.html

Onsomu E (2004). Mechanisms and strategies of educational finace. Paris, France: International Institute for Educational Planning/UNESCO.

RIDE. (2014). physical environment.thrive. rhode Island's coodinated school health programme. Retrieved 10 17, 2014, from Healthy School Buildings: http://www.thriveri.org/components/physical_environment.html

SWASH. (2009). The centre for global safe water at Emroy university, sustaing and scaling school based water, sanitation and hygiene, plus community impacts. Retrieved 01 28, 2012, from SWASH + BASELINE REPORT: http://www.swashplus.org

UN. (2007). The Millennium development goal report 2007. Retrieved 10 17, 2014, from http://www.un.org/millenniumgoals/pdf/mdg2007.pdf

UNICEF. (2009). Kenya at a glance. Retrieved 2012, from Kenya country programme: http://www.unicef.org/kenya/overview_5189.html

UNICEF. (2011). Water, sanitation and hygine annual report 2010. Retrieved 2012, from UNICEF WASH section , programmes, UNNICEF New York.

UNICEF/IRC. (1998). A manual on school sanitation and hygiene water, environment and sanitation technical guidelines- no. 5. Retrieved 2012, from UNICEF/ Pogramme division water, environment and sanitation: www.unicef.org/wash/files/sch_e.pdf

UNICEF/IRC. (2005, 01 24-26). Water, Sanitation and Hygiene Education for Schools round table meeting. Retrieved 10 17, 2014, from Roundtable Proceedings and Framework for Action.

UNICEF/WHO. (2009). Diarrhoea: why children are still

dying and what can be done. Retrieved 03 2012, from the United Nations Children's Fund (UNICEF)/ world Health Organisation (WHO).

UN-Water (2006). Kenya National Water Development Report, World Water assessment Programme, water a shared responsibility. UN.

WHO & UNICEF. (2010). Progress on sanitation and drinking water. Geneva, Switzerland: WHO.

WHO. (2008). Review of primary health care in the African region. Retrieved 2012

WHO (2009). WASH Standards in Schools in Low cost settings. (J. Adams, J. Bartram, Y. Chartier, & J. Sims, Eds.) Geneva Switzerland: WHO.

WHO. (2014, 03). media center. Retrieved 07 26, 2014, from Household air pollution and health: htttp:// www.who.int/mediacenter,factsheets/fs292/en/