Improving access to safe water in rural schools of Kenya: Qualitative multisectoral insights

Peter Kirira
  Mount Kenya University  https://orcid.org/0000-0002-5233-4876

Fiona Oyatsi
  Strathmore University

Ashley Waudo
  Partners for Care

Samuel Mbugua (✉ smungai@mku.ac.ke)
  Mount Kenya University  https://orcid.org/0000-0001-6611-9256

Research Article

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Abstract

Comprehensive strategies in water, sanitation and hygiene, appropriate hygiene behaviors can improve school enrolment and improve gender parity disparities. Lack of safe drinking water negatively impacts the social capital of people, especially school-going children in rural areas. In this study, we systematically evaluated and documented evidence on the barriers and facilitators in access and adoption of safe water practices in rural schools in Laikipia County.

We used an ethnographic formative, collaborative implementation research design using an iterative and participatory process to evaluate community, socio-economic and health system related factors affecting water, hygiene, and sanitation strategies. Qualitative data was collected using key informant interviews (5) and focus groups (3) from various multisectoral participants. Directed content analysis was used to develop codes, categories, and themes from textual data. Data was organized according to the Promoting Action on Research Implementation in Health Services framework.

The findings were classified and described under three key elements- context, evidence, and facilitation. Contextual elements showed an association of diarrhea outbreak with unsafe hygiene practices compounded by water scarcity. The evidence elements were indicative of applicability of the backpack in strengthening handwashing, storage, and transport of water. Facilitation elements indicated evidence of gaps in synergy between school health and public health system necessitating multisectoral collaboration and social capital capacity building.

The national and county governments play an imperative role in ensuring access and continuous supply of safe drinking water in schools. This is fundamental in efforts towards reducing social inequalities of health among school going children and building their social capital. Participatory, collaborative, multisectoral interventions and decision making are crucial, leveraging on creating local ownership, in meeting the water consumption needs of children and communities in water scarce regions.

Introduction

Diarrhea accounts for 297,000 deaths in under 5 children and 929,000 deaths in all population groups globally resultant from unsafe drinking water, sanitation, and hand hygiene (WASH) [1]. This translates to more than 1,000 deaths in under 5s daily from WASH-related diseases [2]. Use of unsafe drinking water sources a substantial contributor to diarrheal diseases [3]. Sustainable development goal 6, target 6.1 demands for universal and equitable access to safe and affordable drinking water for all. Safe drinking water, sanitation and hygiene, appropriate hygiene behaviors, collectively referred to as WASH, can reduce exposure to enteric micro-organisms [4]. Waterborne diseases are considered an essential indicator of health in deprived populations [5, 6], with an estimated 45.8 per 100,000 deaths in Africa attributed to WASH diseases.

Numerous school-going pupils in developing countries miss school or have ineffective schooling due to diseases associated with unsafe drinking water and inadequate sanitation [7]. 400 million children in
developing countries, an average of one in every five children, have no access to safe water. This is exacerbated by the fact four out of five children use surface water or walk for more than 15 minutes to find a protected water source [8]. Basic education outcomes will be difficult to attain and sustain without safe water in schools, for drinking, handwashing, food preparation, and general hygiene and sanitation [9]. In Kenya, two in five Kenyans are aged between 4 years to 17 years [10].

The importance of point-of-use water treatment with chlorine as a low-cost water treatment option as a component of WASH strategies is well documented in literature [11, 12]. However, substantial barriers resulting in low utilization of WaterGuard (comprised of dilute chlorine) in households have been reported [13], indicative of the vital desideratum of behavioral change communication.

Increased school enrolment and improved disparities in gender parity can be achieved using a comprehensive WASH programme that incorporates improved water sources [14]. Safely managed water in schools greatly contributes to the Kenyan government’s goal in providing quality education and training in line with targets set to achieve the Vision 2030, and a necessity to several provisions outlined in the constitution [9]. In a study evaluating the impact of a safe school-based water and hygiene program in rural schools in Western Kenya, O’Reilly et al. [15] indicated that the program resulted in a 35% reduction in absenteeism. Improved access is a critical elemental component in ensuring combating of diarrheal diseases, promoting hygiene, improved school attendance, productive time utilization and women empowerment [3]. There is compelling evidence on the positive influence of school water and hygiene on educational outcomes. The promotion of hygiene and a water treatment intervention resulted in a significant reduction in school absenteeism by 58% among girls [16]. In Laikipia county’s sub-basin, the main source of water is rivers [17]. Schools lack basic water services with students having to fetch water from the river and/or boreholes. This can result in missing classes and waterborne diseases in this vulnerable population [18].

The scarcity in safe drinking water negatively impacts the social capital of people, especially school going children, living in rural areas of Kenya. Social capital, referring to features of social organization that facilitate cooperation and coordination for mutual benefit [19; 20], is a pivotal component of community-based interventions and has been associated with better social wellbeing and community resilience. Our research team previously demonstrated the benefits of enhancing safe water in supporting nutritional interventions [21]. In this study, we systematically evaluated and documented evidence on the barriers and facilitators in access and adoption of safe water practices in rural schools in Laikipia County. This qualitative study provides reflections of various stakeholders in schools, community and governance on safe water access and adoption.

Materials and Methods

The context
The study was conducted in Laikipia County. Our participants were purposively selected from various multisectoral, multilevel levels of governance and programmatic service delivery relevant to WASH strategies. The program addressed multiple etiologies, using school-based and community-centric approaches, to ensure an integration process of the intervention accounting for lived experience, daily routines, and expected change in behavior. Our innovation was the water backpack (PackH2O), an innovative product designed to provide a cleaner, safer alternative to the often-contaminated jerry cans used by children and women in developing countries for water transport, storage and dispensing. It offers the most benefit in the school set-up as one water backpack impacts on 30–40 children unlike at the household level where one water backpack will only impact on roughly five individuals in the home. In 2021, 1,000 water backpacks were installed to be used as safe water dispensers in 66 resource constrained public primary schools in Laikipia County in Kenya. The backpacks were distributed to each class and training was conducted on staff and pupils on the appropriate use of backpacks.

**Research design and data collection**

We adapted an ethnographic formative, collaborative implementation research design using an iterative and participatory process to evaluate community, socio-economic and health system related factors affecting water, hygiene, and sanitation strategies. A secondary aim of the study was to assess the fidelity of utilization of water backpacks by pupils as an innovative resource aiding in water transportation, storage and dispensing.

We conducted 5 key informant interviews and 3 focus group discussions. The focus groups comprised of headteachers, deputy headteachers and teachers selected from 20 schools among the 66 that received the water backpacks. The views and opinions of the teachers are fundamental to understanding the pupil, the school's and the community's barriers and facilitators to safe water. The key informants were purposively selected and comprised of the public health officer, education officer, two senior Community health volunteers (CHVs) and the local Member of County Assembly (MCA). The public health officer provided insights on the role of the health care system in school-based and community-centric WASH strategies; the education officer provided perspectives on the role of the ministry of education in oversight of school-based interventions; the CHVs were provided community-centric perspectives on the synergy between school health and community health; and the MCA was instrumental in alluding to the role of governance structures in ensuring safe water for schools and communities. The MCA is the political representative in charge of an administrative ward within the devolved governance structures of the Republic of Kenya.

**Data analysis**

Qualitative data was collected using audio tapes and field notes, translated, transcribed, and exported into QSR Nvivo v12 for analysis. Directed content analysis processes were used to develop codes, categories, and themes from textual data. Data was organized according to the Promoting Action on Research Implementation in Health Services (PARIHS) framework that describes the successful implementation of the intervention as a function of nature and quality of evidence, characteristics of the
context, and the facilitation strategies. This was employed as a two-stage process. Experiences and perceptions on the utilization of water backpacks were evaluated using qualitative techniques to generate narratives. The context elements include the culture, community leadership and receptivity of the intervention were also assessed qualitatively. Evidence elements entailed the needs and preferences of school-going children and the community, and the local practice on ensuring safe drinking water in the schools.

The analysis of qualitative narratives involved transcribing the interviews verbatim and transcription. Second iterative reading refined the emergent themes. The final analysis contained context, evidence, and facilitation elements relevant to the successful implementation of water backpacks in WASH strategies.

**Ethical considerations**

Ethical clearance was sought from Mount Kenya University’s Institutional Scientific Ethics Review Committee-MKU/ISERC/2642. All research activities and data handling were in strict compliance with national and global ethical standards. Written informed consent was obtained from each participant before conduct of an interview. Personal identifiers were not included during data collection, entry, and analysis.

**Results**

1. **Context elements**

1.1. **WASH strategies in school health programs**

The pupils in water-constrained schools were required to each bring water for daily utilization from home or ‘protected water sources’. The participants strongly associated the outbreak of diarrhea in schools with unsafe water and poor hygiene practices among pupils.

“...... you’ll tell pupils to come with water tomorrow and maybe that water is from cooking their own food, you’ll find that some of the boys spit in that water, others add urine(laughter)to that water. And this is so we just get report from other pupils’ teacher, such as so and so added urine or saliva in that water so as we say, they think that they are being punished. But you see that water is theirs to use in school.” *(FGD, Teachers)*

“or that water you've used in handwashing still you'll see the kids washing their face with it. When they are washing their face, there can be this bacterium, like this one we were saying the kids were having diarrhea.” *(KII, Senior CHV)*

In some instances, the poor or insufficient hygiene practices stem from the child’s household indicative of salient risks to the health of the child and the family. There was appreciation of the water packs as an integral intervention in the pathway of ensuring water safety.
“we have containers at home for the herbs and other chemicals that are used in the shambas. You find that pupils because they don’t have good containers they just take those containers and they put water, so when you are smelling that water you find that they are for the herbicides, so thank you for the water packs because we teachers we make sure that the water that is being put in those containers they are very clean for all of us, even our staff we have one we just drink water from this class....” (FGD, Teachers)

There were conflicting perspectives of the health system’s synergistic interaction between School health and public health system. Some respondents, as indicated by these narratives from the MCA and CHV, opined of evident school health monitoring and pupil education on hygiene and sanitation.

“And we go and check how those children sleep, the way they are treated there in the dormitories by the matron. So, we teach them cleanliness mostly inside the dormitories and outside and if they are girls, the way they should be kept.” (KII, Senior CHV)

“In each area we have public health officers who are supposed to be visiting each school facility now and then and ensure that health standard is up to date. And that is how we follow up. And in case there is any challenge you know we also interact with the parents in case they realize they is something that is not adding up well they just let us know and by then we make a follow up. Yeah, so if the officer in that area hasn’t been able to identify it, they make that…after the follow up they make that effort of pushing and now the officer making a follow up to ensure that all the requirements are really upheld.” (KII, MCA)

1.2. Availability of safe drinking water in schools and communities

There is a perennial lack of/shortage of safe drinking water resulting from adverse environmental conditions.

“those areas.. especially where am from, there’s no water. That’s one thing that gives us a problem.” (KII, Senior CHV)

This scarcity of water results in children and community members having to travel long distances to fetch water, some of which is not safe for consumption.

“I saw where others go to fetch water is far, its about a kilometer. Especially when there was drought, some were using money for water to be brought to them, that one is now a challenge. “We don’t have water, if we had water we could be using it” (KII, Senior CHV)

Local government provided water utility services in some areas but generally, communities and schools resulted to surface water (springs) and digging wells to meet their water needs.

“... we’ve got proper water circulation from the water company to some of the schools. But in some areas, they don’t have such supply. Those are the areas that we have had challenges.” (KII, MCA)
“….here is a lot of water shortage in fact most of our schools do not have piped water and you find that the pupils go in the nearby well or maybe there is a spring somewhere so they go and fetch water using the water bags and they come and hang them in the school.” (KII, ECD)

In some areas, schools must purchase water to meet the sustenance needs during the drought season.

“like the time we had the drought, the water flow within the school was very limited and so we used to buy water from outside. After the water is brought in the school it is distributed in those bags so every class has its own water.” (FGD, Teachers)

2. Facilitation elements

2.1. Synergy between School health and public health system

Some participants from the focus groups felt there was a disconnect between the public health department and schools with one respondent saying that health workers only visit schools during outbreaks, deworming or immunization. This is suggestive of a need for multisectoral collaboration in health and social capital policy generation.

“In my school I think they don't come regularly, they take some time. Maybe once a term.” (FDG, Teachers)

“They have not, they have not! Because the time you see them coming in is when they is an outbreak, maybe they're immunizing or they are giving this..this tablet for deworming. That time you will see them in schools.” (KII, ECD)

Some of the roles of the public health department in school health that were mentioned included identification of health challenges in schools, finding solutions to these challenges, routine inspections, ensuring compliance to public health safety codes and standards, and advocacy on handwashing.

“…..each term am supposed to visit each school and identifying the health challenges that are in schools, liase with the administration on the ways to resolve the health issues encountered in the schools. And then where things go beyond, we also give notices on how to effect those changes when they are not complying, so we may write a notice to the institution especially when you give verbal notice once or twice when it is not responded to. And water is very crucial when it comes to health of the children in schools. We also advocate on handwashing facilities in schools.” (KII, PHO)

“the public health officers do come to schools for routine inspections, inspections in the toilets and classrooms, yes inspections.” (FGD, Teachers)

2.2. Role of Community health volunteers
The respondents acknowledged the CHVs as an essential facet of community needs assessment and sensitization.

“…..in our line of duty we usually liaise with community health volunteers who are the members of health service delivery. Community health volunteers are in touch with the members of the community because they are the ones used to identify challenges, health problems in the community. So even the water backpacks they the ones who can disseminate that information to the community through community health volunteers.” (KII, PHO).

The CHVs were perceived as critical community resource persons with a vital role in health promotion and prevention of disease.

“In the same point I also felt like, in our communities there are people called voluntary health workers. Who go from... they know each household in their area. So, they are at a position of them understanding the situation that are in various homes, those families that cannot be able to treat their water, where they get their water from, and by doing so they go around and sensitive members of the community the way they sensitive vaccination, toileting, if you could involve those voluntary health workers from the society. I think the community has embraced them, they understand them, they come to tell us about the hygiene and so if we involve them they can deliver the message into the community. “ (FGD, Teachers)

2.3. Community and WASH

The participants reflected on the role of the community in ensuring availability of safe and hygienic water. Clean and hygienic water and practices results in higher class attendance, reduction in mortality and morbidity and higher retention rates in schools.

“You know when you have safe water life becomes very easy. Especially now the children do not get sick, so they are not out of school, they do not miss classes, we are even going to reduce deaths because now maybe children get those infections, they may end up dying. So we reduce that and then the retention in schools and even clean water in schools for washing classes” (KII, ECD)

2.4. Role of political governance in WASH

The participants highlighted a lack of government commitment in provision of WASH commodities e.g. water guard. This results in reliance on external partners.

“I think unless we have a funding agency or a donor, the government is not forthcoming most of the times. But we can have a donor who can supply the water guards to the schools is well and good. But in most cases we get a short supply which is not adequate. They supply maybe to the ECDs at intervals. We may stay up to a year without even getting the supply.” (KII, PHO)

“…..we need the county government to take supply of water as a priority especially to the school and the public health to be involved.” (FGD, Teachers).

3. Evidence elements
The water backpack was introduced as an innovation geared to aiding school-going pupils in the transport, storage and dispensing of water. The backpack is a portable product that allows pupils to carry water on their back with straps instead of the conventional jerrycans that can be cumbersome, and the water easily contaminated.

3.1. Water backpack usage in storage and transport of water

The water backpack presents an ergonomic advantage in water transport over the conventional jerrycans.

“the way I see that bag, first it's the way of transport, carrying it) it is so good........ in the community, these bags there are times we go to ceremonies, and they are easy to carry them. Also in transport, where we go to hang them from the venue, how you use it, you carry it even at the back and take it to wherever you want.” (KII, Senior CHV)

“... one of the best things I came to learn of the water bags, it's one of the best mode whereby it can be utilized anywhere, you can move with it wherever you're going. Even you can have a version in a farm.” (KII, MCA)

The respondents lauded the backpack as a more hygienic, easy to transport, larger storage capacity and easy to clean solution. They also highlighted the backpack's durability as a key feature of preference.

“...on the transportation and storage, the backpacks are convenient to both the user and even the ones you'll be dispensing the water to. So. the only shortfall is the, the opening as its subject to contamination if not well handled. But the package is usually good especially for the ECDs that we started with. the backpacks are more sanitary handled other than the jerrycans that you cannot clean properly. They are more hygienic to the users and the community. And it is also comfortable when you’re carrying it because when it is in the back it's a bit stable other than the jerrycans that you use one handle which are not well balanced. Again, when it comes to cleaning the backpack can easily be cleaned once you remove” (KII, PHO)

“the bags can hold more water compared to the jerrycans. Again, they are convenient because when they are going home they drain the extra water, you fold them and take them to the rooms. They can take less space for storage.” (FGD Teachers)

3.2. Backpack use in handwashing

The role of the backpack in strengthening public health hygiene and sanitation through hand washing was emphasized. It was used in most schools as a component of handwashing where it was hanged outside classrooms and toileting facilities.

“When they go to the toilet they have known the hygiene. They all know after visiting the toilet you pass by the water pack and clean your hand. It is known in the schools now.” (KII, ECD)
“I can say that washing of hands has become a norm because you see a pupil from the toilet running direct to the point to clean their hands, whether the teacher is in class or not, even if she or he is late she doesn’t care, she has to clean their hands” (FGD, Teachers)

3.3. Evidence of backpack utilization

The respondents referred to the use of the backpacks in community social events to ensure access to clean water.

“…. whenever maybe you have a function somewhere it can be placed in a strategic position for the purpose of the members of the public. Because at times we have function whereby you try to source for water points far and wide but some few water bags within the community will be of very much benefit.” (KII, MCA)

The backpack helped in reducing pupils’ congestion around waterpoints, offering more points in which pupils can access water.

“…. according to our schools and observations, the water backpacks has helped to reduce the congestion at water points in schools. We put them in classes so there’s no that congestion at the water points.” (FGD Teachers)

The backpack was viewed as a beneficial intervention in increasing access to safe drinking water in schools. This is evident in this reflection from the focus groups with teachers.

“this activity is very good because since the water backpacks were provided to schools by you we have seen a lot of improvements, first of all our children who have problems of getting clean water now they are able to get the water because this bags are hanged in front of every class. So every class has a bag for that purpose and we encourage our pupils to use that water purely for drinking.” (FGD, Teachers)

Discussion

The Kenya Health Policy objective on elimination of communicable conditions mentions two vital priority policy strategies touching on WASH (1) promotion of good hygiene and sanitation to control water and foodborne diseases; (2) increasing access to improved water safety and sanitations [22]. The findings of this study present perspectives of multisectoral stakeholders in primary school health and WASH. The participant representation was drawn from teachers, school administrators, governance and leadership and community health. The findings are summarized under three domains: contextual, evidence, and facilitation elements, in line with the PARIHS framework [23].

Evidence elements entailed utilization of the water backpack in storage and transport, handwashing leveraged on general backpack utilization. The perspectives of various key players in school health and WASH suggested the applicability of the backpack in strengthening handwashing, storage, and transport of water. Contextual elements featured included WASH strategies in schools and availability of safe
water. Key findings showed an association of diarrhea outbreak with unsafe hygiene practices compounded by water scarcity. Similarly, Freeman et al. [16] indicated water-supply improvement, hygiene promotion and water treatment and sanitation interventions resulted in a reduction in diarrhea incidence. There is need to strengthen hygiene education using an integrated approach [7]. Some of the schools had recurrent shortage of safe drinking water due to adversative environmental conditions attributed to drought and climate change. While it takes time, effort, and resources to modify elements of context, a well-developed multidisciplinary facilitation approach involving all key sectors in water access and WASH can drive the change process [24].

Facilitation refers to empowering the implementation process of an intervention into practice. There was evidence of gaps in synergy between school health and public health system necessitating multisectoral collaboration and social capital capacity building. Social capital can help in the realization of mutually beneficial and accountable cross-fertilization between sectors and agencies [25]. There is need for intersectoral action for health aimed at integrating systematic health concerns in other sectors’ routine policy processes whilst identifying opportunities for promoting the quality of life. The CHVs play an unparalleled role in WASH strategies. They are a vital asset in the bridging of the interface between the community and the health system and are increasingly involved in WASH behavior change promotion [26]. The place of community-based service delivery in achieving health for all can thus not be ignored for impactful interventions that promise a high return on investment [27]. Consequently, the perspectives herein allude to a vital role of the community in WASH strategies. Tsekleves et al. [28] echo this by broaching on the need to leverage on community engagement through co-design and co-production for wider community ownership and acceptance of WASH interventions. The role of key actors such as political governance in WASH programs indicates a lack in commitment in provision of WASH services. To achieve long-term sustainability of WASH strategies and social accountability, there is need for constructive engagement and coordination on service provision [29].

**Conclusion**

The invaluable importance of collaborative efforts in ensuring safe drinking water for children in schools is at the heart of ensuring sustained child health, growth, and their academic excellence. The national and county governments play an imperative role in ensuring access and continuous supply of safe drinking water in schools. This is fundamental in efforts towards reducing social inequalities of health among school going children and building their social capital. The adoption and of the water backpack requires robust community health systems championed by public health officials and community health workers to ensure sensitization and acceptance in rural communities. The children in these communities are a valuable resource in household uptake and utilization of water since children and women undertake the chores of fetching water daily. Therefore, creating awareness on safe drinking water among school going children will benefit the community. Participatory, collaborative, multisectoral interventions and decision making are crucial, leveraging on creating local ownership, in meeting the water consumption needs of children and communities in water scarce regions.
Declarations

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Competing interests

None declared.

Authors’ Contributions

PK conceptualized the idea, wrote the first draft, and participated in the interpretation of results. FO and AW participated in data collection and reviewed the manuscript. SM conducted the analysis, and reviewed the manuscript for substantial intellectual content.

Availability of Data

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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