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Effects of Availability and Access to Safe Drinking Water on Students' Academic Performance in Secondary Schools in Muhoroni Sub-County, Kenya

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***Abstract**: Access to improved sanitation is an important component of human health and wellbeing. Minimum requirements for safe WASH in schools are not provided in most rural schools in Kenya. The current paper investigated the effects of availability and access to safe drinking water on students' academic performance in secondary school in Muhoroni Sub-County, Kenya. Descriptive research design and mixed methodology was used. The target population was 2354 form three students and 23 teachers. Krejcie and Morgan sample size determination formula was used to obtain a sample size of 331 respondents. Questionnaires and interviews were used to collect data. Validity was determined by consulting research supervisors while reliability was determined through the use of Cronbach Alpha. Quantitative data were analysed by SPSS (version 25) and the findings presented using frequencies and percentages while qualitative data were thematically classified and arranged before they were reported in narrations and quotations. The study found that 65.4% of the learners reported that they were using safe drinking water in their schools. In addition, 63.3% of the study participants reported that their schools had reliable, sufficient and clean water supply. The study concluded that availability of safe drinking water at schools reduces the likelihood of water-related illnesses, such as diarrhea or other waterborne diseases. In addition, availability to sanitation facilities influence students' academic performance among secondary school students. This study will give the current WASH scenario of schools in the study area that can help concerned authorities abide by WASH guidelines to improve the school's WASH situation.*

***Keywords:** Availability, Access, Safe Drinking Water, Students' Academic Performance*

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1. Introduction

Basic sanitation entails having access to facilities for the safe disposal of human waste (feces and urine), as well as the ability to maintain sanitary conditions through garbage collection, industrial/hazardous waste management, and wastewater treatment and disposal (UNICEF and the World Health Organization, 2012). According to WHO and UNICEF (2012), the world will not meet the United Nations' Sustainable Development Goals (SDGs) sanitation target unless development is accelerated immediately to halve the proportion of people without sustainable access to basic sanitation. Thus, sanitation is considered to be essential in all places of work and circumstances, particularly in schools.

Access to improved sanitation is an important component of human health and wellbeing (Busienei, Ogendi, & Mokua, 2019). Globally, by 2015, approximately 2.4 billion people lacked access to basic sanitation with 892 million people still defecating in the open (WHO, 2019). The lack of access to basic sanitation, the use of unsafe drinking water, and poor hygiene are said to be responsible

for about 88% of all deaths from diarrheal diseases in developing countries (Wolf *et al.*,2018).

Since the prevention and management of communicable illnesses remains a global concern (WHO/UNICEF, 2014), there has been a global call to action to address diseases caused by a lack of water, sanitation, and hygiene. This is remarkable given the literature's findings on the efficiency of cleanliness in the prevention of contagious diseases such as diarrhoea, trachoma, schistosomiasis, infectious hepatitis, dental plaque and caries, periodontal disease, and other faecal-oral disorders. Handwashing with soap and water after defecation and before consuming food has been regarded as good handwashing. Brushing teeth at least twice a day is also considered good oral hygiene (Dobe, Mandal & Jha, 2013).

Students in low-income settings are at substantial risk of water, sanitation, and hygiene (WASH) related infections such as pathogens causing diarrheal diseases, soil transmitted helminths (STH), and trachoma. According to Chard, Garn, Chang, Clasen and Freeman (2019) crowded, unsanitary conditions may facilitate the spread of pathogens and increase students' risk for diseases. Conversely, access to adequate WASH facilities at school may have the potential to reduce the risk of diseases and absenteeism among students (Trinies, Garn, Chang & Freeman, 2016). According to United Nations International Children's Emergency Fund [UNICEF], (2016) schools with adequate water, sanitation, and hygiene (WASH) facilities have reliable, sufficient and clean water supply; sufficient number of private toilets that are safe, clean, and gender segregated; adequate hand washing facilities with water and soap; and hygiene education in the school curriculum.

These WASH facilities should cater for the whole school community which includes small children, pubescent girls, and children with disabilities. Improved school WASH conditions for example, adequate water quality and quantity, provision of soap, improved latrine access and cleanliness may reduce student's absence by providing a learning environment that is clean, private and safe. Such a school environment appeals to learners, specifically older girls of menstruating age to attend school since they are guaranteed of personal hygiene at all times (Pearson & Mcphedran, 2008).

In Africa, a study by Garn, Trinies, Toubkiss and Freeman, (2017) on the role of adherence on the impact of a school-based water, sanitation, and hygiene intervention in Mali, found that increased access and adherence to multiple WASH components was important for improving health but that there was no effect of the intervention on pupil absence. The study findings suggested that a comprehensive WASH intervention and a focus on increasing adherence may help maximize the health effects of school WASH programs, but that WASH alone might not be sufficient to decrease pupils' absenteeism.

A study conducted by Wanjiku, Gachahi and Mwaruvie, (2017) on availability of sanitation facilities in schools concluded that lack of sanitation amenities such as piped water and good toilets led to occurrence of diseases such as typhoid, cholera and other highly contagious diseases which affect learners' access to education through high absenteeism rates. The study further poised those sicknesses contributed to lower academic achievement among students due to absenteeism and low cognitive development due to illnesses. Lack of proper Sanitation amenities was also associated with incidences of diseases among students and this resulted in an increased rate of absenteeism in schools. Similarly, a study conducted by O'reilly *et al.*,(2008) on the impact of a school-based safe water and hygiene programme on knowledge and practices of students and their parents in Nyanza province, western Kenya concluded that school-based safe water and hygiene programme described in the study showed promise for reducing absenteeism by improving the quality of the school environment, and changing behaviour in the home through knowledge transfer from students to parents.

Even if poor hygiene practices can be avoided in low- and middle-income countries (LMICs), active public health programs must concentrate on identifying individuals who are most vulnerable (Peltzer & Pengpid, 2014). As a result, studies into the sociodemographic factors that influence hygienic behaviors, particularly among adolescents, are necessary. Previous research on the factors of teenage hygiene behavior has largely been done in countries like India, Saudi Arabia, and Lebanon, with an emphasis on oral hygiene (Anand & Prakash, 2018). In general, these studies have related poor oral hygiene among adolescents to male sex, low socioeconomic position, rural location, smoking, alcohol and cannabis use, insufficient exercise, and infrequent fruit and vegetable intake. A few research on hand hygiene and sleep hygiene have also been carried out (Cruz & Bashtawi, 2016).

In addition, despite the proven effectiveness of improved sanitation and hygiene practices in educational settings (Willmott, *et al.*,2016), there is evidence that maintaining good hygiene practices in low-income countries has a relatively low implementation rate (Smith, *et al.*,2020). In Kenya, all schools were required by the government to put in place hand washing stations with adequate water and soap. However, very few schools in the study area fully implemented the policy due to lack of adequate clean water and in some instances lack of budgetary allocations. This leads to emergencies of communicable diseases in these

schools affecting student school attendance which have an effect on learner performance. The current study was undertaken among school going learners in Muhoroni Sub-County, Kenya.

Minimum requirements for safe WASH in schools, such as drinking water from an improved source, useable improved facilities and handwashing facilities with available water and soap (WHO, 2019) are not provided in most rural schools in Kenya, particularly in Muhoroni Sub-County, Kisumu County. According to a 2017 school-based study (Morgan *et al.*,2017), 25% of the 198 surveyed schools relied on unimproved drinking-water sources, 38% of the schools had unsafe sources, contaminated with E. coli, and 44% of the schools collected drinking-water off-premises. About 25% of the rural schools had unimproved sanitation facilities and insufficient provisions for menstrual hygiene, and overcrowding of sanitation facilities was common in 24% of schools. Handwashing facilities were largely lacking (40%), as were soap (87%) and hand drying materials (81%) (Morgan *et al.*,2017).

According to county director of Education (2020), public secondary schools lack sanitation facilities as compared to private secondary schools in the study area. During the covid-19 period, all schools were required to implement the WASH programme, however, statistics show that the wash programmes are dysfunctional since learners no longer use them. In addition, the inadequacies in hygiene and sanitation services in most public secondary schools in Muhoroni sub-County have an influence on disease occurrence amongst learners affecting the number of days they attend school. This in turn influences the overall performance of learners in these schools and thus the current study investigated the effect of sanitation and hygiene practices on students' academic performance in public secondary schools in Muhoroni Sub-County, Kenya.

2. Literature Review

Access to safe water, adequate sanitation services, and improved hygiene practices could prevent a significant number of infections (Anand & Prakash, 2018). A lack of awareness of the health benefits of personal hygiene is a common cause of poor health among schoolchildren (Khatoon, Sachan, Khan & Srivastava, 2017). Handwashing has become a major priority in the promotion of hygiene practices in recent years, not least since unwashed hands are the source of many upper respiratory and diarrhoeal diseases, particularly colds and gastroenteritis. However, personal hygiene extends beyond the hands. For example, oro-dental hygiene, which involves brushing and flossing your teeth on a regular basis, can help you avoid foul breath, gum disease, and tooth decay (Rajbhandari, Dhaubanjar & Dahal, 2018). Body odor and skin problems can be caused by poor body hygiene, including wearing unclean clothing.

The impact of inadequate and unclean water, lack of sanitation, and poor hygiene behavior on disease burden is a complex issue. Human behavior about the practice of appropriate hygiene considerably increases the prevalence and severity of hygiene-related outbreaks in endemic areas (Njoh, 2010). In impoverished countries, poor hygiene habits are a serious issue (Dube & January 2012). In underdeveloped nations, hygiene and sanitation-related diseases constitute a tremendous burden, causing many people to become ill and even die. Schools have been frequently linked to the spread of gastrointestinal disease. Improvements in hygiene behavior are the most critical barrier to many infectious diseases because people can lower their risk of disease exposure by following safe practices and using appropriate facilities (Tambekar, & Shirsat, 2012).

Negative health practices such as toilet avoidance and poor hydration adversely impact on pupils' attention and cognitive performance in class and on their health and well-being (Merhej, 2019). Besides the environmental provisions for WASH services, WASH education is of importance as well: the risk of parasitic infections, for example, is lower in children with knowledge of hygiene and sanitation practices. Moreover, WASH interventions with an integrated education component are more efficient and ensure commitment and adherence to healthy practices such as handwashing (Joshi & Amadi, 2013).

Several studies have found a positive relationship between sanitation and hygiene practices and students' academic performance. For example, a study conducted by Fehintola *et al.,* (2017) in Nigeria found that students who had access to improved sanitation facilities, such as clean toilets and hand washing stations, had higher academic performance than those who did not. The study also found that students who practiced good hygiene habits, such as regular hand washing, had better academic performance than those who did not.

Similarly, a study conducted by Freeman *et al.,* (2017) in Kenya found that providing improved sanitation facilities in schools led to improved attendance and academic performance among students. The study found that students who had access to clean toilets were more likely to attend school regularly and had higher academic performance than those who did not. Another study conducted by Snel *et al.,* (2014) in Indonesia found that hand washing promotion programs in schools led to a significant reduction in absenteeism among students. The study found that students who were taught proper hand

washing techniques were less likely to miss school due to illness, leading to improved academic performance.

In addition to their health benefits, sanitation and hygiene practices may also have indirect effects on students' academic performance. For example, a study conducted by Spears *et al.,* (2013) in India found that improved sanitation facilities in schools led to a reduction in open defecation, which in turn led to a reduction in the incidence of water-borne diseases. The study found that students who were less likely to suffer from water-borne diseases were more likely to attend school regularly and had better academic performance than those who were not. It is worth noting that the relationship between sanitation and hygiene practices and academic performance may be affected by other factors, such as socioeconomic status, gender, and cultural factors. For example, a study conducted by Caruso *et al.,* (2015) in Bangladesh found that while improved sanitation facilities had a positive effect on the academic performance of girls, the effect was not significant for boys. The study also found that cultural factors, such as the perception that menstruation is dirty or shameful, may affect girls' attendance and academic performance.

According to previous research, students' performance can be affected due to social, psychological, economic, environmental, and personal factors (Alsharari & Alshurideh, 2021). It has been reported that a learner's performance in school is influenced by various factors including a student's learning ability, race, and gender (Kurdi, Alshurideh, Salloum, Obeidat, & Al-dweeri, 2020). Additionally, motivation simulates energy and a sense of desire in students to stay committed to a subject, goal, field or job (Al-Maroof *et al.*,2021). However, the current study investigated the effect of sanitation and hygiene practices on students' academic performance in public secondary schools in Muhoroni Sub-County, Kenya.

3. Methodology

This research was carried out in Muhoroni Sub County, of Kisumu County, Kenya. The Sub- County is situated in Nyanza, Kenya. Its geographical coordinates are 0° 90' 0" South, 35° 12' 0" East. It has 23 secondary schools spread across the five wards: Chemelil/Tama, Muhoroni/Koru, Masogo/Nyang'oma, Miwani and Ombeyi wards. The inadequacies in hygiene and sanitation services in most public secondary schools in Muhoroni sub-County have an influence on disease occurrence amongst learners affecting the number of days they attend school. This in turn has an effect on the overall performance of learners in these schools.

This study used descriptive research design and thus data were collected from the population at a single point in time as pointed out by Wang and Cheng (2020). This approach was considered ideal for this study since it required direct responses from study participants while studying current phenomena without changing the variables. This study also used mixed methodology (MM) where both quantitative and qualitative approaches of data collection and analysis were used. Mixed methods as a methodology, includes philosophical assumptions that provide directions for the collection and analysis of data from multiple sources in a single study (Dawadi, Shrestha & Giri, 2021).

The target population of this study comprised of all students from public boarding secondary schools in Muhoroni Sub-County. According to Sub-County Director of Education (2022), there were 23 public boarding secondary schools with a student population of 6346 students and 23 boarding masters/mistresses. However, the current study only targeted Form three students from the 23 public secondary schools, thus giving a target population of 2354 students and 23 teachers who were in-charge of boarding, thus giving a total of 2377 respondents.

The sample size for this study was based on Krejcie and Morgan (1970) sample size determination formula. The formula is given as:

$$n = \frac{X^2 * N * P(1-P)}{\left(ME^2 * (N-1)\right) + (X^2 * P * (1-P))}$$

Where:

n=Sample size
X^2=Chi Square for the specified confidence level at 1 degree of freedom= (3.841) from tables
N=Population size
P=Population proportion (.50 in the table)
ME=Desired margin of error (expressed as a proportion=0.05)

=3.841x2377x0.5 (1-0.5)/ 0.05x0.05 (2377-1) +3.841x0.5 (1-0.5)
= 2247.94525/6.81025
= 331

Using the formula, a total of 331 respondents were obtained and used in the study. The study used simple random sampling to select the schools and students of public boarding secondary schools. According to Rahi,

Alnaser, and Abd Ghani, (2019), simple random sampling guarantees that every item in the population has an equal likelihood of being nominated for the study at any given phase of sampling procedures, thus circumventing biasness in the selection process. Purposive sampling was used to select the teachers in-charge of the boarding section in the selected schools. Purposive sampling, according to Saunders and Bezzina (2015), allows the researcher to use subjects that have the necessary information for the study. The current study used questionnaires and interview schedules to collect both quantitative and qualitative data.

In ascertaining the validity of the research instruments, the researcher designed questionnaires and interview schedules that adequately addressed the construct or area under investigation. In addition, research experts from the University of Eldoret who had content in the area under investigation were consulted and their comments used to improve the questions in the questionnaire and interview schedules. In determining the reliability of the research instruments, the researcher pilot tested the instruments in the nearby Kisumu Central Sub- County, which shares similar characteristics as the study area. Thereafter Cronbach Alpha Coefficient was calculated. A reliability coefficient of equal or more than 0.70 was considered adequate to allow the researcher to proceed with the study as per the recommendations of Taber (2018). For interviews, the researcher ensured that data collected information did not have any minor errors and at the same time all the research themes were captured during the instrument preparation, the process of interviews and during the analysis stage.

The quantitative data from the questionnaire were first subjected to preliminary processing through validation, coding and tabulation in readiness for analysis with the help of the Statistical Package for Social Science (SPSS) computer package (Version 26). Frequencies, percentages, mean and Standard deviation were used to analyze quantitative data. Qualitative data from interview schedules were thematically classified and arranged before they were reported in narrations and quotations as per the research objectives. The analyzed data were presented in tables and graphs. In addition, the quantitative analysis was supplemented by qualitative descriptions to explore and expand on the quantitative finding in order to provide in–depth explanations of the findings and validation.

The researcher observed all the rules and regulations in carrying out research in Kenya. Before undertaking fieldwork, a research permit was sought from relevant authorities including the National Council of Science, Technology and Innovations (NACOSTI) and the, Director of Education, County Commissioner and Principals of the Selected secondary schools. Privacy, confidentiality and openness in data collection was ensured throughout the study. The researcher further sought consent from the class teachers to allow the students to participate in the study since they (students) were still considered as minors. In terms of trustworthiness, respondents were asked to be open and honest when answering the questions. The identity of the respondents were not revealed in this research, and the data obtained were purely used for the academic purposes of this study.

4. Results and Discussion

The aim of this paper was to find out how availability and access to safe drinking water influence students' academic performance in secondary school in Muhoroni sub-county. To achieve this objective, the study participants were requested to indicate their level of agreement/disagreement on statements which covered how the availability and access to safe drinking water influence students' academic performance in secondary school in Muhoroni sub-county. The participants rated their response on a five-point Likert scale questions as; on a scale of 1-5, as Strongly Disagree (SD=1) Disagree(D=2) Neutral (N=3) Agree (A=4) and Strongly Agree (SA=5). Their responses were tabulated and the results are presented in Table 1.

Table 1: Responses on Influence of Availability and Access to Safe Drinking on Students' Academic Performance

Statement	SD		D		UD		A		SA	
	F	%	F	%	F	%	F	%	F	%
Safe drinking water is accessible to all students and staff throughout the school premises	36	12.5	60	20.8	4	1.4	134	46.4	55	19.0
Water provided in school meets quality standards as recommended by public health	26	9.0	72	24.9	14	4.8	106	36.7	71	24.6
Our school has reliable, sufficient and clean water supply	36	12.5	69	23.9	1	.3	137	47.4	46	15.9
There is a water treatment facility for water that we use in our school	131	45.3	60	20.8	3	1.0	77	26.6	18	6.2

Table 1 shows that 134(46.4%) respondents agreed with the statement that safe drinking water was accessible to all students and staff throughout the school premises, 60(20.8%) respondents disagreed with the assertion, 55(19.0%) respondents strongly agreed with the statement and 36(12.5%) respondents strongly disagreed with the statement while only 4(1.4%) learners were neutral on the statement. The study found that a majority (65.4%) of respondents reported that they were using safe drinking water in their schools. This implies that most schools in the region have access to safe drinking water. However, according to UNICEF, most of the world's schools lack clean bathrooms, drinking water, and hygiene education for students, particularly schools in rural areas, which either lack drinking water and sanitation facilities, or have infrastructure that is both insufficient in quality and quantity (UNICEF, 2004), creating high-risk situations where diseases can readily spread (Otto, Opatoki & Luyi, 2022). A study by Abanyie, Ampadu, Frimpong & Amuah, (2023) in Ghana found that due to availability of safe drinking water in schools, there was improvement in school attendance and performance of school children. This was attributed to the relatively short distances covered to access drinkable water. This reveals that the provision of improved water supply systems in school plays a significant role in students' academic performance due to reduction in occurrence of WASH related diseases.

Further, 106(36.7%) respondents agreed with the statement that water provided in their schools meets quality standards as recommended by public health, 72(24.9%) respondents disagreed with the statement,71(24.6%) learners strongly agreed with the statement and 26(9.0%) respondents were strongly in disagreement with the statement while 14(4.8%) respondents were undecided on the statement. The responses showed that a majority (61.3%) of the learners in secondary schools in Muhoroni sub-county acknowledged that water provided in their schools meets quality standards as recommended by public health. According to Hussain, Khadim, Aslam and Ghufran (2023) being exposed to contaminated water leads to increased levels of water-related ailments, which has a detrimental impact on schools since it causes chronic absenteeism that hinders learning.

Further, 137(47.4%) respondents agreed with the statement that their schools had reliable, sufficient and clean water supply, 69(23.9%) respondents disagreed with the statement, 46(15.9%) respondents strongly agreed and 26(12.5%) learners strongly disagreed with the statement while 0nly 1(0.3%) respondent was undecided on the statement. From the responses, it emerged that a majority (63.3%) of the study participants reported that their schools had reliable, sufficient and clean water supply. This implies that most of the secondary schools in the study area have reliable, sufficient and clean water supply. Water and sanitation are critical components of a supportive atmosphere and high-quality education. In many impoverished countries, sanitary conditions in schools are appalling (Ana, 2008), and are either insufficient or unavailable, resulting in filthy latrines due to a shortage of water or a far distance from it. These conditions increase the risk of disease, which, according to Egbinola and Amanambu, (2015) have a negative impact on cognition, growth, concentration, physical activities, and academic performance.

In addition,131(45.3%) respondents strongly disagreed with the statement that there were water treatment facilities in their schools, 77(26.6%) respondents agreed with the statement, 60(20.8%) respondents disagreed and 18(6.2%) respondents strongly agreed while 3(1.0%) respondents were neutral on the statement. From the responses, it emerged that 66.8% of the students believed that there were no water treatment facilities in their schools. This implies that most of the schools in the area depended on untreated water for learners which could have effects on student health. This could result in the occurrence of diseases leading to student absenteeism and poor academic achievement.

In order to obtain qualitative information, teachers in-charge of boarding sections were interviewed and it emerged that most of the secondary schools in the study area lacked water treatment facilities in their schools with most schools depending on boreholes or rain water harvesting for their daily use. One of the teachers noted that:

> *It is challenging for our school to provide drinking water to our students and staff since we don't have a well-protected water source. Most of the time we harvest rainwater and I believe this is the safest water source for our learners.*

From the sentiments above, it can be shown that most of the schools need to have water treatment facilities in their schools to ensure safety of drinking water to both students and staff.

5. Conclusion and Recommendations

5.1 Conclusion

The study concluded that availability of safe drinking water at schools reduces the likelihood of water-related illnesses, such as diarrhea or other waterborne diseases. By reducing the prevalence of these illnesses, students are less likely to miss school days due to illness, resulting in improved attendance rates. Regular attendance allows students to

keep up with the curriculum and enhances their academic performance.

5.2 Recommendations

The paper recommended that schools and education policymakers need to prioritize the provision of safe drinking water to all learners and staff to optimize students' academic performance and overall well-being.

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