

## Research Article

### Sanitation and Hygiene at Rural Schools in Swaziland: A Case Study of Ekhukhanyeni Constituency

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**Abstract:** A study was conducted to assess the sanitation and hygiene conditions at schools in Swaziland. It was carried at Ekukhanyeni constituency; a rural community situated about 30 km from Manzini city in the centre of the country. A set of two questionnaires were developed and used to collect data on sanitation awareness and practices in all the 12 schools in the community. One set of questionnaire was administered to all the principals of the schools and another was administered to learners of the highest level in each school, who were randomly selected from each school on the basis of class lists. Water samples were collected from dominant sources of drinking water for each school during the dry season and wet season. The water samples were analysed for total coliform, *Escherichia coli* (*E. coli*) and Enterococci. The majority of schools (8) had boreholes as their dominant sources of water supply. Three schools sourced their water from protected springs, where the water was piped to the schools. One school relied on vendors who delivered the water using mobile water tanks. The total coliform counts were higher than the acceptable standard of less than 10 counts per 100 mL for potable water for all the schools, except one school which sourced its water from a borehole. *E. coli* and Enterococci were detected in water sources from four schools. The toilets to learners' ratio were higher than the recommended ration of 1:30 for all the schools. About 87% of the learners reported that they always used toilets to relieve themselves. 64% of the learners perceived the toilets as clean and free from excreta. Only 34% of the learners reported that they always washed their hands after using toilets. About 66% of the learners reported that they were taught aspects of sanitation and hygiene in their respective schools.

**Keywords:** Domestic water, hygiene, sanitation, water quality

## INTRODUCTION

The Swaziland Ministry of Education and Training is responsible for the education system which begins with primary education at the age of six. Primary education is a seven year programme that culminates with an end of Primary School Examination (PSE) in grade 7. The PSE is a locally based assessment administered by the Swaziland Examinations Council through schools (Examination Council of Swaziland, 2013). Secondary education is a five year programme divided into two levels; junior secondary (3 years) and senior secondary (2 years). There is an external public examination (Junior Certificate) at the end of junior secondary that learners have to pass in order to progress to the senior secondary level. The Examination Council of Swaziland administers this examination. At the end of the senior secondary level, learners sit for a public examination, the Swaziland General Certificate of Secondary Education (SGCSE) and International General Certificate of Secondary Education (IGCSE) which is accredited by the Cambridge International Examination (Cambridge International Examinations,

2014). A few schools offer the Advanced Studies (AS) programme. There are 600 primary schools in the country with an enrolment of 239,793 learners while the number of teachers is 4,722 males and 7,838 female teachers (Government of Swaziland, 2013). There are 217 secondary schools with an enrollment of 83, 096 students and a teaching force of 4, 358 teachers.

Despite all the progress reported worldwide in recent decades, more than 2.6 billion people still live without access to sanitation facilities and are unable to practice such basic hygiene as washing their hands with soap and water (Esrey *et al.*, 2008). Diseases related to poor sanitation and lack of potable water causes many people to fall ill or even die (Cairncross *et al.*, 2010). The proportion of population with access to potable water in Swaziland is 65, with 88 and 60% having access to clean water in urban areas and rural areas, respectively (Manyatsi and Tfwala, 2012). In 1998, 2.2 million people died because of diarrhoeal diseases in the world, of which the vast majority were children (Curtis *et al.*, 2004). While the impact of poor sanitation and hygiene is known to be disastrous for infants and young children, it also has an important

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impact on the health of school-age children including adolescents (UNICEF, 2010).

Schools are a stimulating learning environment for children and initiate change (Barnekow *et al.*, 2009). If safe sanitary facilities in schools are available, they can act as a model and teachers can function as role models. If school sanitation and hygiene facilities are absent, or are badly maintained and used, schools become risky places where diseases are transmitted (St. Leger *et al.*, 2007). Teachers can be effective advocates for hygiene, through hygiene education and through acting as role models for school children (St. Leger *et al.*, 2007). However, good hygiene behaviour and the effectiveness of hygiene promotion in schools are severely limited where water supply and sanitation facilities are inadequate or non-existent (Tshabalala, 2003). Teachers cannot credibly convey the importance of washing hands if there is no water or soap in the school, or promote the proper use of toilets if they themselves avoid their use because the toilets are dirty or unsafe (Barnekow *et al.*, 2009). Most schools curricula do not include environmental aspects focused on water, sanitation and hygiene and their importance on development (UNICEF, 2008). This deprives school children the understanding of water and sanitation concepts at their young age.

Schools, particularly those in rural areas, often completely lack drinking water. For those which have water supply facilities, it has been observed that the source may need repair, may provide insufficient and/or unsafe water, or may be situated in an inappropriate location (Fadare and Olawuni, 2008). Where a public main-water supply is available schools are often connected to the public supply system (Pena and Cordova, 2001). Consideration should be given to the quantity and quality of water available to meet present and future needs for the school (Gyan-Boakye, 2009). Water supply for schools can be obtained from rivers, dams, protected or unprotected springs, protected or unprotected wells, boreholes and roof water harvesting (Manyatsi and Mwendera, 2007). Water from boreholes and protected wells and springs is often considered suitable for domestic use without any treatment (Manyatsi and Tfwala, 2012; Omer, 2002).

Swaziland recognises improved water, sanitation and hygiene in schools as a key intervention to promote children's right to health and clean environment and to influence a generational change in health promotion behaviour and attitudes. However, there is no clear information on the situation of sanitation and hygiene in schools in the country. The objective of the study was to assess the sanitation and hygiene conditions at schools in Swaziland, using Ekukhanyeni constituency as a case study.

## MATERIALS AND METHODS

**Description of study area:** The study was carried at Ekukhanyeni constituency; a rural community situated about 30 km from Manzini city in the centre of

Swaziland. The majority of households practice subsistence agriculture growing crops and raising livestock. The three perennial rivers in the area are Mngwenyane, Ngwazini and Mahhonyane. The population in the community was estimated at 19,374 in 2007 (Government of Swaziland, 2007). The constituency has 12 schools, eight of them being primary schools and four of them being high schools with an estimated total enrolment of 4,842 children (Government of Swaziland, 2013).

**Data collection and analysis:** A set of two questionnaires were developed and used to collect data on sanitation awareness and practices in all the schools. One set of questionnaire was administered to all the principals of the schools. Another questionnaire was administered to learners of the highest level in each school (Grade 7 for primary schools and Grade 12 for secondary schools. Thirty learners (15 boys and 15 girls) were randomly selected from each school on the basis of class lists. Class teachers administered the questionnaires to the learners. The questionnaires were pilot tested in one primary school and one secondary school that was outside the study area for face and content validity, before they were administered. The information solicited by the questionnaires included source of drinking water for the school, profile of school, availability and use of sanitation facilities and perception of school children on water, sanitation and hygiene. The data collected from questionnaires were entered into SPSS software for analysis (SPSS (Statistical Package for Social Sciences), 2008). Responses were reported in form of frequencies and percentages.

Water samples were collected from dominant source of drinking water for each school. Sampling was done using aseptic 500 mL bottles in October 2011 (wet period) and February 2012 (dry period). The collected water samples were kept in cooler boxes filled with ice for transportation and before analysis. The parameters measured were Total Coliform, *Escherichia coli* (*E. coli*) and Enterococci because there are known to be a problem in untreated water in Swaziland (Manyatsi and Tfwala, 2012). The analysis was done at the laboratory of the Swaziland Water Services Corporation in Mbabane, Swaziland using the membrane filtration and incubation method (HPA (Health Protection Agency), 2007).

## RESULTS AND DISCUSSION

**Water sources and water quality:** Unlike in most parts of rural Swaziland where rivers and unprotected wells were the main source of domestic water (Manyatsi and Mwendera, 2007), the majority of schools (8) had boreholes as their dominant sources of

Table 1: Results of water analysis for the observed parameters

Schools	Sources	T_coliform		<i>E. coli</i>		Enterococci.	
		1	2	1	2	1	2
Kukhanyeni primary	Borehole	44	43	0	0	1	0
Seven holy founders	Borehole	276	1300	2	120	4	14
Nkiliji primary	Vendors	2	579	0	0	0	0
Ngwazini primary	Piped spring	727	2420	0	0	0	0
Maliyaduma primary	Borehole	3	167	0	2	0	2
Mphembekati primary	Piped spring	921	41	0	0	2	0
Salukazi primary	Borehole	42	20	0	0	0	0
Sankolweni primary	Piped spring	93	164	0	1	0	3
Kukhanyeni high school	Borehole	15	30	0	0	0	0
Nkiliji high school	Borehole	1553	4	1	0	5	0
Mhlahlo high school	Borehole	0	0	0	0	0	0
Malunge high school	Borehole	11	1986	0	1	1	0

1= Dry period; 2 = Wet period; Threshold values; Total Coliform = 10 counts/100 mL, *Escherichia coli* = 0 counts/100 mL, Enterococci = 0 counts/100 mL (WHO, 2011)

Table 2: Distribution of teachers and learners in the different schools

Schools	Number of teachers	Number of learners	Type of toilets	Toilets for teachers	Toilets for learners	Toilets to teachers ratio	Toilets to learners ratio
Kukhanyeni high	44	454	Flush toilets	2	15	1 : 22	1 : 30
Mphembekati primary	18	571	Pit toilets	4	16	1 : 5	1 : 36
Seven holy founders	16	436	Flush toilets	3	8	1 : 5	1 : 55
Nkiliji primary	19	426	Pit toilets	7	10	1 : 3	1 : 43
Ngwazini primary	9	230	Pit toilets	2	2	1 : 5	1 : 115
Salukazi primary	17	365	Pit toilets	2	14	1 : 9	1 : 59
Sankolweni primary	9	261	Pit toilets	2	8	1 : 5	1 : 33
Malunge high	29	323	Flush toilets	2	6	1 : 16	1 : 54
Kukhanyeni primary	24	549	Pit toilets	2	4	1 : 12	1 : 138
Mhlahlo high	22	413	Pit toilets	2	7	1 : 11	1 : 59
Maliyaduma primary	15	382	Pit toilets	2	4	1 : 8	1 : 96
Nkiliji high	23	432	Pit toilets	2	8	1 : 12	1 : 54
Total	245	4842		31	102		

water supply (Table 1). The boreholes were drilled through the funding of the government of Swaziland. Water was extracted from boreholes using either electric pumps or hand operated pumps. Three schools sourced their water from protected springs that were piped to the schools. Only one school relied on vendors who delivered the water using mobile water tanks. The water was delivered into plastic tanks and the service was supplemented by harvesting rainwater during the rainy seasons.

The results showed that values of total coliform were higher than the acceptable standard of less than 10 counts per 100 mL for all the schools except Mhlahlo high school where total coliform was not detected in both wet and dry period (Table 1). This may be a result of pollution of drinking water sources by surface runoff or by seepage of effluent from nearby pit toilets. Among the different sources of water available in the different schools *E. coli* counts were found to be highest (1,120) at Seven Holy Founders during the wet period of sampling. A relatively low count of *E. coli* was found for all the schools water sources during the dry season compared to the wet period. Enterococci counts for all the water sources in the different schools, during the two periods of investigation and between the types of water sources ranged from 0 counts to 14 counts. Seven Holy Founders primary school recorded

the highest count of 14 during the wet period and also a count of 2 was recorded during the dry period. Nkiliji primary school also recorded an Enterococci count of 5 during the dry period. This could be evident of faecal contamination of the schools water source (Stephen and Ampofo, 2013).

**Availability and use of toilets facilities:** The total number of school going learners in the area stood at 4,842 with Mphembekati primary school having the highest number of learners (571) and Ngwazini primary school the lowest number of learners (230) (Table 2). In total there were 245 teachers in all the 12 schools. Kukhanyeni high school had the highest number of teachers (44). A majority of schools (9) in the area used pit toilets, which could be attributed to lack of piped water to cater for improved systems such as flush toilets. Only 3 schools; Malunge high school, Seven Holy Founders primary school and Kukhanyeni high school used flush toilets system for both learners and teachers. Large variations were observed on the number of toilets units available for learners, with Mphembekati primary school and Kukhanyeni high school having the highest number of toilet units for learners (16 and 15, respectively). Ngwazini primary school had only two toilet units for learners. All the schools had toilet to Pupil Ratio (TPR) of 1:30 and above, which was above

Table 3: Use of school toilets by learners (N = 336)

Schools	Always used toilets		Did not always use toilets		Total
	No	%	No	%	
Seven holy founders	28	97	1	3	29
Sankolweni primary	13	43	17	57	30
Salukazi primary	28	93	2	7	30
Nkiliji high	21	95	1	5	22
Ngwazini primary	10	33	20	67	30
Mhlahlo high	27	90	3	10	30
Malunge high	13	93	1	7	14
Kukhanyeni primary	28	93	3	7	31
Kukhanyeni high	27	93	2	7	29
Nkiliji primary	30	100	0	0	30
Mphembekati primary	29	97	2	3	30
Maliyaduma primary	19	63	11	37	30
Total	293	87	43	13	336

Table 4: Perception of school children on cleanliness of toilets (N = 336)

Schools	Perceived as clean		Perceived as not clean		Total
	No	%	No	%	
Seven holy founders	0	100	29	0	29
Sankolweni primary	28	93	2	7	30
Salukazi primary	8	27	22	73	30
Nkiliji high	5	23	17	77	22
Ngwazini primary	0	0	30	100	30
Mhlahlo high	3	10	27	90	30
Malunge high	4	28	10	72	14
Kukhanyeni primary	11	36	20	64	30
Kukhanyeni high	10	34	19	66	29
Nkiliji primary	30	100	0	0	30
Mphembekati primary	15	50	15	50	30
Maliyaduma primary	5	17	25	83	30
Total	120	36	216	64	336

the recommended TPR of 1:25 for girls and 1:30 for boys (UNICEF, 2004; Mooijman and Zomerplaag, 2004). Under such conditions the possibility was that, such toilets easily get filled up and accumulate bad odour, resulting in learners avoiding them and using open space to relieve themselves, especially when urinating. This poses an environmental hazard which may be propagated outside the school compound affecting surrounding communities. The toilet to teachers ration ranged from 1:3 to 1:22 (Table 2).

**Use of toilets by learners and their perception on cleanliness of toilets:** Out of the 336 learners who responded to questionnaire, 293 (87%) reported that they always used toilets to relieve themselves when in school and 43 (13%) reported that they sometimes did not use toilets when in school (Table 3). This was attributed to poor condition of toilet facilities. Ngwazini primary school and Sankolweni primary school had the highest percentages of learners (67 and 57%, respectively) who did not use the toilet facilities. Nkiliji primary school recorded the highest percentage (100%) of learners who always used toilets facilities when in school, which was a result of the newly constructed toilets. On the issue of perception of cleanliness and condition of school toilets, 64% of the learners perceived the toilets as clean and free from excreta on floors, pans and walls (Table 4). Ngwazini primary

school had the highest percentage (100%) of learners who reported that school toilets were dirty with excreta on the floor, pans and walls. All the learners (100%) of Seven Holy Founders primary school reported that toilets and urinals were free from excreta on the floor, pans and walls, which indicated commitment to sanitation and hygiene for the learners and teachers.

**Hygiene practised by learners:** Out of the 336 learners, only 114 (34%) reported that they washed their hands after using the toilet and before eating (Table 5). Maliyaduma primary school had the highest percentage of learners (83%) who reported that they washed their hands after using the toilets. Sankolweni primary school, Ngwazini primary school and Kukhanyeni high school had the lowest percentage of learners who wash their hands after visiting the toilet and before eating. Hand washing can be encouraged by provision of water closer to toilets facilities and providing soap (liquid soap) for the learners to use (Cairncross *et al.*, 2010; Mara *et al.*, 2010).

**Teaching and promotion of sanitation and hygiene:** The majority of the learners (66%) reported that they were taught aspects of sanitation and hygiene in their respective schools (Table 6). All the 30 respondents from Ngwazini primary school reported that they were not taught about sanitation and hygiene in school. This

Table 5: Hand washing of hands by learners after using toilets (N = 336)

Schools	Always wash hands		Do not wash hands		Total
	Number	%	Number	%	
Seven holy founders	2	7	27	93	29
Sankolweni primary	1	3	29	97	30
Salukazi primary	22	73	8	27	30
Nkiliji high	14	64	8	36	22
Ngwazini primary	1	3	29	97	30
Mhlahlo high	3	10	27	90	30
Malunge high	4	29	10	71	14
Kukhanyeni primary	5	17	25	83	30
Kukhanyeni high	1	3	28	97	29
Nkiliji primary	19	63	11	37	30
Mphembekati primary	14	47	16	53	30
Maliyaduma primary	25	83	5	17	30
Total	114	40	222	60	336

Table 6: Response from students on being taught about water, sanitation and hygiene (N = 336)

Schools	Have been taught		Have not been taught		Total
	Number	%	Number	%	
Seven holy founders	26	90	3	10	29
Sankolweni primary	29	97	1	3	30
Salukazi primary	27	90	3	10	30
Nkiliji high	15	68	7	32	22
Ngwazini primary	0	0	30	100	30
Mhlahlo high	3	10	27	90	30
Malunge high	12	86	2	14	14
Kukhanyeni primary	21	70	9	30	30
Kukhanyeni high	11	38	18	62	29
Nkiliji primary	28	93	2	7	30
Mphembekati primary	11	37	19	63	30
Maliyaduma primary	7	23	23	77	30
Total	222	60	114	40	336

Table 7: Engagement of students in sanitation and hygiene promotion activities (N = 336)

Schools	Those engaged		Not engaged		Total
	Number	%	Number	%	
Seven holy founders	26	90	3	10	29
Sankolweni primary	2	7	28	93	30
Salukazi primary	3	10	27	90	30
Nkiliji high	2	9	20	91	22
Ngwazini primary	0	0	30	100	30
Mhlahlo high	0	0	30	100	30
Malunge high	0	0	14	100	14
Kukhanyeni primary	10	33	20	67	30
Kukhanyeni high	2	7	27	93	29
Nkiliji primary	1	3	29	97	30
Mphembekati primary	10	33	20	67	30
Maliyaduma primary	7	23	23	77	30
Total	65	19	271	81	336

was reflected in the poor sanitation and hygiene in this school. Mhlahlo high school also indicated a higher percentage of learners (90%) who reported that they were not taught about sanitation and hygiene at school.

Ngwazini primary school, Mhlahlo high school and Malunge high school recorded the lowest percentage of learners who had been engaged in sanitation and hygiene promotion activities in school, as all the students (100%) reported that they were not involved in any activities (Table 7). Seven Holy Founders primary school had the highest percentage of learners (90%) who have been engaged in sanitation and hygiene promotion activities. Such activities involve collection of papers around the school compound, proper disposal

of papers and litter through incineration. Learners had formed a health club named "Asihlobe", which went to the extent of going around the community collecting litter using refuse bags.

## CONCLUSION

All the 12 rural schools of Ekukhanyeni constituency had some form of water supply, with the majority of the schools (8) sourcing their water from boreholes. There was evidence of microbial contamination since total coliform counts, *E. coli* counts and Enterococci counts were above the acceptable limits for potable water from some schools.

The water was not treated before drinking, exposing the learners and teachers to a number of waterborne diseases such as cholera, diarrhea and typhoid. The majority of schools (9) used pit toilets and only three schools used flush toilets. Some toilets lacked maintenance and were in poor conditions. Toilets in some schools were not cleaned, with excreta on floors, pans and walls. The toilets to learners' ratios were above the recommended ration of 1 toilet to 30 learners in all the schools. The high toilets to learner's ratios made toilets to accumulate bad odour at a fast rate and some learners ended up not using toilets to relieve themselves. Knowledge levels and conception of hygiene practices was low as the majority of learners (66%) did not perform the basic practises of washing hands after using toilets and before eating.

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