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ORIGINAL ARTICLE

Schistosomiasis knowledge, attitude, practices, and associated factors among primary school children in the Siphofaneni area in the Lowveld of Swaziland

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Abstract *Background:* Schistosomiasis, a worldwide concern, has received attention in Swaziland through control programs such as deworming programs, education programs, and school health programs; however, these programs neglect the importance of monitoring and evaluation strategies such as assessing children's knowledge, attitudes and practices (KAPs) and the prevalence of the disease. Children are a high-risk group because of their water contact practices, and need to be informed about schistosomiasis to influence their attitudes and practices. Social and cultural factors are involved in schistosomiasis control because they instill myths and misconceptions about the disease. As a result, children in the community may be comfortable with bad practices. This study aimed to assess the KAPs of schoolchildren on schistosomiasis, and to identify practices that support or hinder the progress of schistosomiasis control.
Methods: In 2014, a descriptive quantitative cross-sectional survey was conducted through questionnaires among Siphofaneni primary schools, an area hit by schistosomiasis in the Lowveld of Swaziland. A logistic regression model was applied to analyze the data.
Results: Moderate knowledge, good attitudes, and fairly good practices were observed in the children. However, practices of certain children were risky and they still had some misconceptions. Knowledge was correlated with practice and with predictors of good and bad practices such as male sex, always urinating in water, and always using river water for domestic practices.

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Conclusion: This study suggests that empowering children with knowledge and attempting to modify their water contact, and improved human waste disposal practices are necessary for schistosomiasis control.

Introduction

Schistosomiasis, a worldwide concern, affects more than 200 million people globally, and another 500–779 million people are at risk, especially children.[1] It is estimated to cause more than 200,000 deaths per year globally and at least 90% of people requiring treatment live in Africa.[2] The global burden of the disease is 4.5 million disability-adjusted life years.[3] Approximately 80% of all infected people live in sub-Saharan Africa.[4] Neighbors to Swaziland, South Africa, and Mozambique have both *Schistosoma haematobium* and *Schistosoma mansoni* endemics in different parts of these countries.[5]

Most morbidities due to schistosomiasis are borne by school-age-children whose nutritional, physical, and cognitive potential are consequently impaired.[6] Schistosomiasis is prevalent in tropical and subtropical areas, and common in poor communities with limited access to safe water and adequate sanitation.

Schistosoma haematobium has been endemic in the Kingdom of Swaziland for several decades, particularly in the Lowveld. In 1984, northern Lowveld had the highest prevalence (58%) of urinary schistosomiasis in 10- to 14-year-old children, which demonstrates an alarming prevalence of 65.1%. Intestinal schistosomiasis was essentially limited to the Lowveld (18%).[7] In 2010, the Siphofaneni area, which is in the Lowveld, had a prevalence of 6.1% for *S. haematobium* with females having a significantly higher prevalence (10.5%) than males (1.4%). Children had a significantly higher schistosomiasis prevalence (15.3%), when compared with the age group of >19 years (2.6%).[8]

Swaziland has a poor schistosomiasis information collecting system because only data from patients who self-referred to the National Bilharzia Worm Control Program (NBWCP) are systematically collected and reported on a regular basis. Moreover, the *S. haematobium* infection status in most parts of the country is unclear to date. Only 59% of the rural population has pit latrines and 18% of the rural population still uses surface water.[9] Secondary to new dam construction (i.e., the Lubovane Dam) and irrigation schemes in the Siphofaneni area, there is an increased risk of bilharzia infection.[7,10,11] Due to water scarcity, people of the Lowveld utilize water from these dams for various purposes such as domestic use, recreation, and agriculture.

The World Health Organization recommends that children aged 10–14 years should be the target group in the control of schistosomiasis because of their water contact behaviors, and that they should normally be the study population for the baseline survey and for monitoring and the evaluation of intervention strategies because of the epidemiological importance of this group with regard to schistosomiasis.[12] Swaziland has taken steps to control schistosomiasis since 1982 through the establishment of the NBWCP to provide intensive bilharzia surveillance, health education, and routine deworming in primary schools among children in the age group of 6–14 years old to reduce bilharzia-related morbidities. The deworming program was regrettably suspended in 2010 because of drug-related adverse events that occurred in some children.[10]

Immense efforts are being made to control morbidity caused by schistosomiasis; however, it should be borne in mind that monitoring and evaluation of schistosomiasis distribution (i.e., prevalence and intensity), knowledge, attitudes, and practices of the communities have a major role in sustainable control interventions. It is surprising that little is known about the knowledge, attitudes, and practices of children in Grades 5–7 (i.e., 10–14 years), which is the most susceptible age group with regard to causes of and control measures for schistosomiasis. Therefore, this study aimed to explore and describe the knowledge, attitudes and practices of Grade 5–7 primary school children towards schistosomiasis. The specific objectives were (1) to assess the knowledge (K) about schistosomiasis among Grade 5–7 primary school children in the Siphofaneni area; (2) to explore and describe the attitudes (A) of these children towards schistosomiasis control measures; (3) to explore and describe the practices (P) of this target group; and (4) to investigate the correlates of schistosomiasis practices of these children. The study findings have informed the NBWCP about the children's current KAPs so that relevant health education and necessary control measures could be planned.

Materials and methods

Study area and the design

The study was conducted in four of six primary schools in the Siphofaneni area, which is in the Lowveld of Swaziland. This area contains the Lusutfu River, the recently built Lubovane Dam, and 17 streams that are all used for domestic, recreational, and agricultural purposes. There are also new sugarcane irrigation schemes managed by Swaziland Development. There were 869 Grade 5–7 primary school children in the six schools; among these, 146 children responded to the questionnaires on KAP. To investigate schistosomiasis KAPs among Grade 5–7 school children, a descriptive cross-sectional survey was conducted through self-administered questionnaires. Ethical approval was granted by the Swaziland Ethics Committee (Ministry of Health, Mbabane, Swaziland; ethical approval number, MH/599C/FWA00015267/IRB 0009688). Informed consent from schools and parents, and the children's assent were sought before the commencement of the study; hence, participation was voluntary. Probability sampling was used to select participants. The fish bowl sampling technique was used to select the schools and systematic sampling was used to select children from each class in each school. A total of 146 participants were included in the study. For a population of 869, at a 95% confidence level and allowing an error factor of 5%, a sample size of 312 would be required to observe a response distribution of 50% (www.raosoftsamplesize.html) for results to be generalized.

Data analysis

Data collected were entered and analyzed using SPSS 20.0 software (IBM Corp., Armonk, NY, USA). Schistosomiasis knowledge questions were computed. The highest points were allocated for a correct response, followed by "don't know" responses with a score of one and a wrong answer with a score of zero; the total score was 22 points. Schistosomiasis attitude responses were computed with a score of four allocated for the most positive attitude and zero for the most negative attitude. All positive statements were recorded. Scores for schistosomiasis practice were computed in which three points were allocated to the most favorable practice and zero allocated to the undesirable practice; the total score was 30 points. Univariate, bivariate, and multiple regression analysis were used where appropriate.

Results

Sociodemographic results

Among the 146 students, there were more [50.7% (74)] female participants. Demographic data revealed that the ages of the participants ranged 9–19 years with a mean age of 13 $\pm$ 1.96 years. Of the 146 participants, approximately 50.7% (74) students were aged 11–13 years and approximately 35.6% (52) of students were in Grade 5; 34.2% (50) of students were in Grade 6; and 30.1% (44) of patients were in Grade 7. Most [70.5% (103)] participants reported having a river near their homes.

Schistosomiasis knowledge

Knowledge discrepancies were revealed regarding schistosomiasis. Of the 146 participants, most [97.3% (142)] participants had heard about schistosomiasis. Most [74% (108)] participants knew how urinary schistosomiasis presents, but only one (0.7%) participant knew about abdominal schistosomiasis. Only 16.4% (24) of the participants knew that the cause of schistosomiasis was the schistosomiasis worm. Most [74.7% (109)] participants correctly identified contact with water from a river or dam polluted with feces and urine as a risk factor for contacting schistosomiasis. Only 52.7% (77) of students correctly identified avoiding direct contact with river or dam water as a preventive measure against schistosomiasis. Only one (0.7%) student associated schistosomiasis with poor school performance. The data are shown in Table 1.

The mean score on schistosomiasis knowledge was 11 $\pm$ 1.45 points (i.e., 50%) of 22 points with a minimum score of 7 and a maximum score of 15, which made a range of 8 points. The schistosomiasis knowledge scores indicated that the participants' knowledge was average: 82.9% (121) of participants scored 52%–68%, as shown in Table 2.

Table 1 Respondents' knowledge about schistosomiasis (n = 146).

Variable	n	%
Any knowledge about bilharzia		
Yes	142	97.3
No	4	2.7
How does bilharzia present		
Blood in urine	108	74.0
Blood in stools/feces	1	0.7
Diarrhea	12	8.2
Fever and headache	4	2.7
Don't know	20	13.7
Blood in urine/stool	1	0.7
Cause of bilharzia		
Schistosomiasis worms	24	16.4
Growing up	4	2.7
Mosquito	17	11.6
Jumping over fire	12	8.2
Drinking water used by cattle	61	41.8
Don't know	28	19.2
Risk factors for contacting bilharzia		
Contact with water from river/dam polluted with feces/urine	109	74.7
Body contact with an infected person	3	2.1
Walking across water bare-footed	4	2.7
Eating unwashed fruits and vegetables	5	3.4
Don't know	25	17.1
A complication from bilharzia		
Skin cancer	64	43.8
Poor performance at school	1	0.7
Poor appetite	17	11.6
Mood swings	9	6.2
Don't know	55	37.7
Where can you get bilharzia		
From feces/urine contaminated water	117	80.1
From feces/urine contaminated soil	5	3.4
Jumping over fire	9	6.2
Don't know	15	10.3
How to protect yourself from contacting bilharzia		
Staying indoors	4	2.7
Avoid direct contact with river/dam water	77	52.7
Avoid direct contact with raining water	4	2.7
Eating three food groups	33	22.6
Don't know	28	19.2

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Table 2 Knowledge about schistosomiasis (*n* = 146).

Variable	Score	Score (%)	*N*	%
Poor	≤10	≤45	25	17.1
Average	11–15	52–68	121	82.9
Good	≥16	≥70	0	0

Schistosomiasis attitude

Most [86.3% (126)] participants strongly disagreed that schistosomiasis was part of growing up, whereas 67.8% (99) of participants strongly disagreed that a child outgrows schistosomiasis. Approximately 126 (86.3%) participants strongly agreed that defecating in the toilet is very important, whereas 86.3% (126) of participants strongly disagreed that it did not matter if one urinated in river/dam water. Most [87.7% (128)] participants responded positively that learning about schistosomiasis was important, whereas 64.4% (94) of participants strongly disagreed that one can swim/play in water anyhow. The data are shown in Table 3.

The mean score for schistosomiasis attitude was 34.7 ± 2.6 points (i.e., 86.8%) of 40 points. The minimum score was 24 points and the maximum score was 37 points with a range of 13 points. This finding indicated a good attitude of the participants: 95.9% (140) of patients scored above 75%, as shown in Table 4.

Table 3 The respondents' attitude towards schistosomiasis.

Variable	SA		A		D		SD	
	n	%	*n*	%	*n*	%	*n*	%
Schistosomiasis is part of growing up	8	5.5	7	4.8	5	3.4	126	86.3
One outgrows schistosomiasis	12	8.2	14	9.6	21	14.4	99	67.8
Defecating in toilet is very important	126	86.3	12	8.2	2	1.4	6	4.1
It doesn't matter if I urinate in water	11	7.5	2	1.4	7	4.8	126	86.3
It's important to learn about schistosomiasis	128	87.7	6	4.1	3	2.1	9	6.2
It's important to periodically screen for schistosomiasis	118	80.8	22	15.1	0	0	6	4.1
It's important to take antischistosomiasis tablets	119	81.5	16	11	4	2.7	7	4.8
When I pass blood in urine/stool I should go to hospital	136	93.2	8	5.5	1	0.7	1	0.7
I can swim and play in water anyhow	10	6.8	17	11.6	25	17.1	94	64.4
Schistosomiasis can reoccur	45	30.7	16	11	16	11	41	28.1

A, agree; D, disagree; SA, strongly agree; SD, strongly disagree.

Table 4 The participants' score of attitudes towards schistosomiasis (*n* = 146).

Variable	Score	Score (%)	*n*	%
Poor	≤20	≤50	0	0
Average	21–29	52–73	6	6
Good	≥30	≥75	140	95.9

Table 5 Practices towards schistosomiasis (*n* = 146).

Variable	N		S		A	
	n	%	*n*	%	*n*	%
1. Swim/play in river/dam water	31	21.2	81	55.5	34	23.3
2. Urinate in water	108	74	29	19.9	9	6.2
3. Use water from river/dam for domestic purposes	55	37.7	60	41.1	31	21.2
4. Boil water for drinking	67	45.9	37	25.3	42	28.8
5. Cross a river to school or visiting	70	47.9	39	26.7	37	25.3
6. Use protective waterproof clothes when in contact with water	96	65.8	34	23.3	15	10.3
7. Go to health facility when passing blood in urine/stool	20	13.7	25	17.1	101	69.2
8. Take antischistosomiasis deworming tablets at school	27	18.5	29	19.9	90	61.6
9. Pass stool in a bush or water	83	56.8	41	28.1	22	15.1
10. Pass blood in urine	98	67.1	42	28.8	6	4.1

A, always; N, never; S, seldom.

Schistosomiasis practice score

Practice discrepancies were identified pertaining to the participants practice towards schistosomiasis. The most risky practices were swimming or playing in water (78.8%, 115/146 participants), urinating in water (26.1%, 38/146 participants), using water from a river/dam for domestic purposes (62.3%, 91/146 participants), and not using protective waterproof clothes when in contact with river/dam water (65.8%, 96/146 participants). The data are shown in Table 5.

The results also showed that the participants' practice was fairly good with 65.1% (95) of participants scoring ≥73% with a mean score of 22.3 ± 2.8 points (i.e., 73%) out of 30

Table 6 Total scores of practices towards schistosomiasis (*n* = 146).

Variable	Score	Score (%)	*n*	%
Performance				
Poor	≤15	≤50	0	0
Average	16–21	53–70	51	34.9
Good	≥22	≥73	95	65.1

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points. The minimum score was 16 points and maximum score was 28 with a range of 12 points. The data are shown in Table 6. A significant positive correlation existed between schistosomiasis K and P ($r = 0.181$, $p = 0.029$).

Determinants of schistosomiasis preventive and control practices

Predictors of positive and negative practices were observed through regression analysis, as shown in Table 7.

Discussion

Schistosomiasis control in Siphofaneni can only be successful and sustainable if the disease is considered a major problem and children have the knowledge, positive attitudes, and correct preventive and control practices.

Children's knowledge needs vigorous supplementation to influence their practices and enhance behavior change. Lack of schistosomiasis knowledge is a risk factor for contacting schistosomiasis.[6,13] School is the right place to

Table 7 Multiple linear regression analysis and the predictors of good schistosomiasis prevention and control practices ($n = 146$).

Predictor variable	R^2	Adjusted R^2	R^2 change	F change	p	Durbin–Watson
	92.6	91.5	92.6	115.563	0.000	1.576
Variable		Unstandardized coefficients		Standardized coefficients		Sig
		β	STD error	Beta	t	
Sex						
Female		REF				
Male		−0.330	0.152	−0.059	−2.180	0.031*
Swim/play in river/dam water						
Seldom		REF				
Always		−0.939	0.177	−0.140	−5.247	0.001**
Never		0.998	0.180	0.146	5.542	0.001**
Urinate in water						
Seldom		REF				
Always		−0.958	1.021	−0.082	−0.939	0.350
Never		1.144	0.159	0.179	7.189	0.001**
Use water from river/dam for domestic purposes						
Seldom		REF				
Always		−1.081	0.198	−0.158	−5.467	0.001**
Never		0.767	0.160	0.133	4.785	0.001**
Boil water from river/dam for drinking						
Seldom		REF				
Always		0.881	0.184	0.157	4.792	0.001**
Never		−1.024	0.203	−0.166	−5.042	0.001**
Cross a river to school/visiting						
Seldom		REF				
Always		−1.623	0.165	−0.252	−9.864	0.001**
Never		0.707	0.543	0.126	1.301	0.195
Use protective clothing when in river/dam water						
Seldom		REF				
Always		0.095	0.809	0.010	0.118	0.906
Never		−0.887	0.155	−0.150	−5.721	0.001**
Go to hospital when passing blood in urine						
Seldom		REF				
Always		1.487	0.168	0.245	8.853	0.001**
Never		−1.400	0.741	−0.172	−1.890	0.061
Take bilharzia prophylaxis at school						
Seldom		REF				
Always		1.393	0.163	0.242	8.544	0.001**
Never		0.392	0.698	0.054	0.562	0.571
Pass stool in bush or water						
Seldom		REF				
Always		−1.796	0.226	−0.229	−7.949	0.001**
Never		0.964	0.167	0.171	5.789	0.001**

Beta (β), a measure of the contribution of each variable to the model; REF, reference point, constant; Sig, significance.
*$p < 0.05$. **$p < 0.01$.

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educate children about schistosomiasis because most children in the Siphofaneni area go to school. However, to change human behavior or to make people accept new kinds of health behavior is difficult.[14]

The knowledge level about schistosomiasis issues is average, and an information gap exists among children because some children still hold false notions about the etiology of blood in urine, which negatively influences their practices.

Children's attitudes were positive, therefore, their behavior is not influenced by negative attitudes, but by other underlying factors. Even though the children's practices are fairly good, a good proportion of children who have bad practices remain at risk for infection. Most risky practices were related to their water contact behaviors, which was also observed by Abo-Madyan et al,[6] and human waste disposal practices, which was also reported by Midzi et al.[15]

The children's health-seeking behavior was good. However, some children refuse bilharzia prophylactic treatment that is disseminated at school. Some children previously had schistosomiasis infection, and the absence of an alternative water source makes their practices risky. They consequently become used to the disease and bad practices, and they view the disease as a part of their lives. When people live with a disease for a long time, they tend to regard it as a part of their everyday life.[16] Raised in a society of people that tend to have explanatory models about their illnesses, (i.e., how they become ill and what they can do to prevent and treat illnesses), the children have misconceptions about the disease. Karamagi et al[17] reported that certain signs and symptoms tend to be given unique names in such societies, and the long term consequences of a lack of proper treatment such as poor school performance are also justified as witchcraft.

Sex was a predictor for schistosomiasis, which is related to the gender roles of girls that expose them to water contact practices such as washing clothes, fetching water for domestic purposes, whereas boys conform to the Swazi cultural definitions of a man and as such engage in risky behaviors such as swimming/playing in water. The predictors of positive and negative practices are primarily related to water contact practices, human waste disposal and health-seeking practices; hence, these issues require urgent attention to successfully control schistosomiasis.

The findings of the study imply the necessity of collaboration between NBWCP, school health departments and teachers, and providing teachers with workshops about schistosomiasis to ensure that the children receive correct information about schistosomiasis. Other methods to improve the children's knowledge about schistosomiasis could involve the media and rural health motivators. Community health nurses in the Siphofaneni area should develop community-based interventions that involve children in the control and prevention of schistosomiasis such as developing special cards and posters, and periodically screening and teaching children about schistosomiasis. There is also a need for periodic assessment of schistosomiasis KAP coupled with prevalence of schistosomiasis in children.

Conflicts of interest

The authors declare no conflicts of interest.

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