Risk factors for schistosomiasis transmission among school children in Gwanda district, Zimbabwe

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ABSTRACT

Introduction: A nationwide cross sectional schistosomiasis survey conducted in 2011 in 280 primary schools found a prevalence rate of 22.7%. This warranted an intervention with Mass Drug Administration at all schools in line with WHO guidelines. This study aimed to identify risk factors for schistosomiasis transmission among Grade 3 children at two primary schools in Gwanda district.

Methods: A descriptive cross sectional survey which was part of a larger study on Malaria and Bilharzia in Southern Africa (MABISA) was conducted. Grade 3 children (n = 120) attending two purposively selected rural primary schools in Dombo and Ntalale in Gwanda were respondents. Data on socio-demographic characteristics and risk factors which included knowledge and practices were collected using a pretested interviewer administered questionnaire.

Results: Of the 120 children, 98 (81.7%) of the children indicated that they did not consistently use the toilet. The other risk factors for schistosomiasis were bathing and swimming in rivers and dams 80 (66.7%), watering the vegetable gardens using unprotected water sources 77 (64.7%) and crossing rivers on their way to school barefooted 31.7%. History of schistosomiasis cases based on self-reporting indicated that of the 9 children 7 were girls. There was poor knowledge of schistosomiasis among the children with 54% of the children indicating that they had never heard about the disease. Misconceptions on the causes of schistosomiasis which included drinking dirty water, mosquitoes and flies as the causes of schistosomiasis were reported by the children. Parents were cited as the least disseminators of information on schistosomiasis with only 4 out of the 120 children having received information from their parents.

Conclusion: Frequent contact with unprotected water sources, non-use of the toilet, and lack of information on schistosomiasis could predispose the children to infection. There is need to raise awareness about schistosomiasis in schools and the community to reduce the risk of contracting schistosomiasis due to risky behaviour.

1. Introduction

Schistosomiasis is a parasitic disease caused by the blood flukes from the genus schistosoma. The main disease causing Schistosome species are Schistosoma haematobium, S. mansoni, S. japonicum and S. intercalatum (Gryseels et al., 2006). The disease which ranks second to malaria kills an estimated 280 000 people each year in the Sub Saharan region alone (Egbendewe-Mondzozo et al., 2011). Globally 800 million people are at risk of contracting schistosomiasis and 76 countries are endemic (Yang et al., 2006). Active transmission is reported in 67 countries and of these 46 are in Africa (Aagaard-Hansen et al., 2009).

Like one of the neglected tropical disease (NTDs) schistosomiasis largely occurs in resource poor settings where it poses a serious public health burden (Ngeng et al., 2014; World Health Organisation, 2015). The disease causes severe morbidity in large parts of Africa, particularly sub Saharan Africa where 224 million are affected (World Health Organisation, 2015). About 120 million people infected with schistosomiasis are estimated to be asymptomatic where as 20 million are said to have developed severe disease because of not being treated at the early stages of the disease (World Health Organisation, 2015). Schistosomiasis is prevalent in most parts of Africa where there are large water bodies (World Health Organisation, 2015). In Zimbabwe, schistosomiasis is ranked the 9th mostly reported out-patient illness (Zimbabwe National Health Profile, 2011). Transmission is particularly high among persons residing in rural and agricultural areas where there are dams and irrigation schemes; and communities are generally poor, ignorant, have poor housing, have poor hygienic practices and have poor or no sanitary facilities (Ngeng et al., 2014).
The most common schistosome species found in Zimbabwe are *S. mansoni* and *S. haematobium* (Zimbabwe National Health Profile, 2011).

Control of schistosomiasis has been neglected for many decades mainly because it rarely kills and its signs and symptoms are only taken seriously when permanent impairment occurs. The disease has however received reasonable attention in recent times with much effort and resources being invested in the efforts to understand and control it (Chimbari, 2012; Hotz et al., 2007a, b; Utzinger and de Savigny, 2006; World Health Organisation, 2008).

Despite having been controlled in many countries the disease still poses a serious burden in Africa particularly in sub-Saharan Africa (Kabuyaya et al., 2017). Zimbabwe is one of the countries that has recently been hardest hit by the disease and this calls for understanding the risk factors associated with its transmission. A study by Midzi and colleagues indicated limited knowledge on the disease. (Midzi et al., 2011). The tendency has been to use 8–10-year-old children as proxy indicators of community infection and knowledge status to guide treatment strategies in endemic areas (Midzi et al., 2011). Children spend most of their time travelling to and from school and often have contact with water infested with intermediate host snails for schistosomiasis (Midzi et al., 2011). The most common schistosome species found in Zimbabwe are *S. haematobium* and *S. mansoni* (Z. Nyati-Jokomo, M.J. Chimbari, Acta Tropica 175 (2017) 84–90).

Assessment of people's knowledge about a disease helps in understanding the disease transmission. A study on knowledge of Schistosomiasis conducted among school children in Zimbabwe showed that 32% of the respondents had good knowledge of the disease and 50.6% were not aware of the disease risk factors, causes or symptoms (Midzi et al., 2011). Children in that study had misconceptions about the causes of schistosomiasis which included eating green mangoes, eating too much salt, witchcraft and jumping over fire. The authors explained that these misconceptions could be wrong information passed on to children by their parents.

Children in Grade 3 have not yet been introduced to lessons on schistosomiasis in school, hence their knowledge could reflect their parental knowledge or based on whether they have suffered from the disease or not (Midzi et al., 2011). A study in Zimbabwe reported low levels of knowledge among community members (Chimberengwa et al., 2014). Similarly in Kano State, it was observed that there is a high level of ignorance regarding the causative agent, mode of transmission of the disease, its debilitating effect and curability. Some wrongly thought they contracted the disease from taking too much salt (Duwa et al., 2009).

Understanding the risk factors for schistosomiasis transmission in communities is an important determinant for successful control and prevention programmes. It is on this basis that we conducted this study on the risk factors for schistosomiasis transmission among 8–10 year old children in the two schools.

2. Methods

2.1. Study area and population

The study was conducted in Gwanda district in Matabeleland South Province of Zimbabwe in a semi-arid community. Gwanda lies in region five which is characterised by poor rainfall and high levels of poverty. This study is part of a larger study which aims to investigate the impacts of Malaria and Bilharzia in the context of climate change in three Southern African countries (Botswana, South Africa and Zimbabwe). Two wards were purposively selected, namely Ntalale ward which has five primary schools and Selonga ward which has three primary schools. In Ntalale ward, we selected Ntalale Primary School and in Selonga ward, Dombo primary school was selected. Ntalale primary school relies on water from three rivers and three dams for irrigation and domestic purposes. Dombo primary school is serviced by three dams which are mainly used for irrigation purposes.

2.2. Materials and methods

A descriptive cross sectional survey of Grade 3 children (7–12 year olds) was conducted at the two primary schools in Gwanda district (n = 120) in March 2015. Out of the eight primary schools in the two wards (5 from Ntalale and 3 from Selonga) one school from each ward with the highest numbers of Grade 3 children was selected. The school registers at the 2 schools were used as the sampling frame. According to the registers at the two schools, 125 children met the criteria (Grade 3) although the researchers only managed to interview 120 (96%). The five children who were not interviewed did not bring back signed consent letters from their parents. The questionnaire administered to the children included questions on demographics, children's knowledge of causes of schistosomiasis, signs and symptoms of schistosomiasis, their water contact behaviours and their history of Schistosomiasis infection. The children stated what they knew without being given options. A knowledge score was generated based on correct responses given by the children. We considered correct causes and risk factors for schistosomiasis transmission as swimming, bathing, crossing rivers barefooted, fishing, collection of water for domestic purposes, playing, urinating or defecating in rivers or dams. Out of a possible score of 10, we categorised knowledge as follows: 0–3 as poor, 4–6 as average, and more than 7 as good. The determination of having suffered from schistosomiasis was through the children's self-reporting of having had a history of Schistosomiasis. Structured questionnaires translated into Ndebele and Suthu languages were used. Study tools were pre-tested at one of the non-participating primary schools in the study area.

2.3. Sample size determination

All the Grade 3 children in the two selected schools were included in this sub component (n = 120). The Grade 3s were considered as a proxy for their parents' knowledge and practices since at this level they would not have been taught about Schistosomiasis at school. The children had recently undergone Mass Drug Administration which was conducted at all schools irrespective of infection levels hence the omission of conducting a parasitological survey.

2.4. Ethical approval

The study protocol was reviewed and approved by the University of Zimbabwe institutional review board (JREC 200/14) and the UKZN Biomedical Research Ethics Committee (BREC REF 409/14). The purpose of the study was explained to the participants, confidentiality was assured and written informed consent and assent were obtained from the study participants after they had received full information about the study. To maintain anonymity, children's names were not recorded.

2.5. Data analysis

Data were analysed using EPI INFO version 11. Characteristics of the respondents were described and univariate analysis of all potential risk factors was conducted. The strength of association among variables was reported using the 95% confidence intervals.

3. Results

All interviewed students (120) responded to all the questions hence there was a 100% response rate. The distribution of Grade 3 students by school was Ntalale, 67 (55.8%) and Dombo 53 (44.2%). Overall there were more girls 62 (52%). The children's ages ranged from 7 to 12, with an overall mean age of 8.9 years. Seven point five percent (7.5%; 9/120) of the had a history of urinary schistosomiasis. Table 1 summarises the demographics of the children.
3.1. Water contact patterns of school children

The majority (90.83%) of the children helped with water collection for domestic use. Children who said they helped with water collection were likely to state the connection between the activity and likelihood of contracting schistosomiasis ($p = 0.009$). Two thirds of the children (64.2%) helped with watering a vegetable garden at home. The water used for watering the garden was from unprotected sources. Of the 120 children, 38 (31.7%) crossed a river without a bridge barefooted on their way to school. Two thirds of the children (66.7%) reported swimming or bathing in rivers. Of the 9 who had suffered from schistosomiasis, 4 crossed a river barefooted and 7 had bathed or swam in rivers or dams. The risk of contracting schistosomiasis for those who had contact with unprotected water bodies were 1.73 times (OR = 1.73, 95% CI 0.3–10.2) compared to those who used protected water sources.

3.2. Sources of water used at home

From the total of 120 children, 62 (51.6%) cited the borehole as their main source of domestic water. Over a third 44 (36.7%) used dam water as their daily water source at home and 27 (22.5%) used river water. Of those who had previously suffered from schistosomiasis, 6 out of 9 reported using the borehole as the main water source at home. A third of those who had suffered from schistosomiasis used the river as their water source at home.

3.3. Sanitary facilities used at home

Of the 120 children (81.7%) reported that they sometimes defecated in the bush and 3 (2.5%) reported that they urinated in water bodies. Two thirds of the children (81 out of 120) had no toilets at home. Six out of nine children who had previously suffered from schistosomiasis reported not having toilets at home.

3.4. Knowledge of signs and symptoms of schistosomiasis

More than half of the students (69 (57.5%) had poor knowledge of the signs and symptoms of schistosomiasis. Only 17 (14.2%) stated passing urine with blood as a sign or symptom while 5 (4.2%) said coughing, 3 (2.5%) said headaches and 2.5% stated dizziness. Less than 1% mentioned passing stool with blood as a sign of having schistosomiasis. Five out of the 9 children who had suffered from schistosomiasis were not able to identify the signs and symptoms of the disease (see Fig. 1).

3.5. Knowledge on causes and transmission of schistosomiasis

Of the 120 children 64 (53.3%) did not know how one could get infected with schistosomiasis. Swimming in stagnant waters as a risk factor for schistosomiasis was mentioned by 35 (29.2%), 15 (12.5%) cited contact with water bodies whilst fishing and sharing the same toilet was mentioned by 2 (2.4%).

Of the 120 children, 20 (16.67%) had an idea that snails were involved in the transmission process. When asked whether infected snails could transmit schistosomiasis, 55 (45.83%) said they were not aware. Some of the misconceptions regarding Schistosomiasis transmission included drinking dirty water 18 (15.3%), mosquitoes and flies (5.3%) (see Fig. 2).

In this study 62 of the 120 children (51.7%) were not aware of how schistosomiasis is prevented. Out of the 120 children only 40 (33.3%) correctly mentioned avoidance of stagnant water as a way of preventing schistosomiasis. Avoidance of swimming in rivers and dams was cited by only 5 out of the 120 (4.2%). There were no significant differences in knowledge by gender as shown in Table 2.

3.6. Sources of Information about schistosomiasis

Out of the 120 children, 55% had not received specific information from school or other sources on schistosomiasis. The school was
mentioned as a source of information by less than half of the students (40%). Parents were not a commonly mentioned source of information as only 4 out of the 120 children had heard about Schistosomiasis from their parents (see Fig. 3).

### 3.7. Age and vulnerability to schistosomiasis transmission

Out of the 120 children only 9 (7.5%) said they had once been infected with schistosomiasis. The majority of children (7 out of 9) who had previously suffered from schistosomiasis attended school at Ntalale. Transmission of schistosomiasis was highest among the 9 year olds with 7 out of 9 reporting having suffered from the disease.

### 3.8. Health seeking behaviour

Children were asked of their opinion on whether they thought schistosomiasis was a disease that could be treated. Half of the students thought schistosomiasis was treatable, with 35.2% stating that it was not treatable and 15.8% not knowing. Majority of the students 92 (76.7%) reported that they had been given praziquantel at school during the Mass Drug Administration programme. Only a few (6.7%) of the children reported that the tablets made them sick. Of the 9 children who had suffered from schistosomiasis 7 sought treatment from the health facilities and the 2 children said they had been taken to faith healers who gave them holy water for treatment. Interviews with the health staff revealed that there could be underreporting and under diagnosing of schistosomiasis as the facilities did not have diagnostic equipment. Children suspected of having schistosomiasis were referred to the next level of care which was not easily accessible.

### Table 2

Gender disaggregated knowledge about schistosomiasis.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heard about schistosomiasis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>30 (25%)</td>
<td>27 (22.5%)</td>
<td>57 (47.5%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>28 (23.3%)</td>
<td>35 (29.2%)</td>
<td>63 (52.5%)</td>
<td>0.370</td>
</tr>
<tr>
<td>Signs and symptoms of schistosomiasis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passing urine with blood</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>10 (8.3%)</td>
<td>7 (5.8%)</td>
<td>17 (14.2%)</td>
<td>0.350</td>
</tr>
<tr>
<td>No</td>
<td>48 (40%)</td>
<td>55 (45.8%)</td>
<td>103 (85.8%)</td>
<td></td>
</tr>
<tr>
<td>Passing stool with blood</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1 (0.8%)</td>
<td>0</td>
<td>1 (0.8%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>57 (47.5%)</td>
<td>62 (50.7%)</td>
<td>119 (98.2%)</td>
<td>0.483</td>
</tr>
<tr>
<td>How does one get schistosomiasis?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td>16 (13.3%)</td>
<td>19 (15.8%)</td>
<td>35 (29.2%)</td>
<td>0.713</td>
</tr>
<tr>
<td>Contact with water bodies</td>
<td>42 (35%)</td>
<td>43 (35.8%)</td>
<td>85 (70.8%)</td>
<td></td>
</tr>
<tr>
<td>Preventing schistosomiasis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoid stagnant water</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>21 (17.5%)</td>
<td>19 (15.8%)</td>
<td>40 (33.3%)</td>
<td>0.518</td>
</tr>
<tr>
<td>No</td>
<td>37 (30.8%)</td>
<td>43 (35.8%)</td>
<td>80 (66.7%)</td>
<td></td>
</tr>
<tr>
<td>Avoid swimming</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4 (3.3%)</td>
<td>1 (0.8%)</td>
<td>5 (4.2%)</td>
<td>0.148</td>
</tr>
<tr>
<td>No</td>
<td>54 (45%)</td>
<td>61 (50.8%)</td>
<td>115 (95.8%)</td>
<td></td>
</tr>
<tr>
<td>Who told you about schistosomiasis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>23 (19.2%)</td>
<td>25 (20.8%)</td>
<td>48 (40%)</td>
<td>0.941</td>
</tr>
<tr>
<td>Parents</td>
<td>35 (29.2%)</td>
<td>37 (30.8%)</td>
<td>72 (60%)</td>
<td></td>
</tr>
<tr>
<td>Parents</td>
<td>2 (1.7%)</td>
<td>2 (1.7%)</td>
<td>4 (3.3%)</td>
<td>0.946</td>
</tr>
<tr>
<td>No</td>
<td>56 (46.7%)</td>
<td>60 (50%)</td>
<td>116 (96.7%)</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 2. Knowledge of ways of transmission of schistosomiasis.

Fig. 3. Source of information on schistosomiasis.
Discussion

No parasitological survey was conducted during this study as there had just been a Mass Drug Administration programme in which all school going children were treated. Thus we relied on children's self-reporting as screening of children would not have been meaningful and cost effective. The overall prevalence of children self-reported history of Schistosomiasis among Grade 3 children at Ntalale and Dombo primary schools was 7.5%, which was lower than prevalences based on actual screening in rural and commercial farming areas in Zimbabwe (Midzi et al., 2011). This may be attributed to livelihoods and water contact patterns which are determinants of transmission. Ntalale primary had more children that reported having been infected with schistosomes. This could be because pupils at Ntalale are close to more water bodies (3 rivers and 3 dams) where they collect most of their domestic water and are involved in risky recreational activities. The majority of children from Ntalale also reported their involvement in fishing activities. The children from Dombo School, despite having three dams in the school vicinity might have been discouraged from playing in the water as there were reports that the dams were crocodile infested.

This study confirmed water contact by children from both schools. Since Schistosomiasis requires intermediate snails found in water bodies for further development into infective cercariae, water contact of humans is an important risk factor. Studies in Zimbabwe reported that 63.2% and 36.5% respondents in the farming areas and rural areas, respectively used unsafe water (for washing/bathing and reported Schistosomiasis infection) (Midzi et al., 2011). Children at the two schools in Gwanda had frequent contact with water bodies for recreational and domestic purposes, a similar finding by Okoli and Odaibo in Ibadan, Nigeria (Okoli and Odaibo, 1999). Another study of 3 primary schools in Sudan found that Schistosomiasis was significantly associated with the frequencies of contaminated water contact, taking baths, swimming and they also found a significant correlation between self-reported haematuria and urinary schistosomiasis (Ismail et al., 2014). In our study area, some dams had been constructed for irrigation purposes and during the dry season when the water tables were low, the children would play in the water. A study in Kenya found the construction of an artificial pathway as a risk for S. mansoni host snails as school aged children frequently came into contact with lake water (Nagi et al., 2014).

A study conducted in 2011 in Zimbabwe found that schistosomiasis was prevalent in 84.6% of the 280 primary schools (Midzi et al., 2014). The study found a country prevalence of 22.7% with our study area having a 14.7% prevalence. Following the recommendations of the national survey, the two schools have been part of the yearly Mass Drug Administration (MDA) programme in the country which targets all school going children were treated. Thus we relied on children's self-reported history of schistosomiasis at school.

We observed a difference in prevalence of symptoms between Grade 3s could be due to poor knowledge of the disease and the effect of the MDA which had been recently conducted. A study in 1991 in Zimbabwe found low prevalence rates after treatment of children with praziquantel (Chandiwana et al., 1991). The lack of knowledge on the disease by the Grade 3s could be because the children had not yet been taught about schistosomiasis at school.

In our study most of the children who reported having had a history of schistosomiasis were 9 year old (6 girls and 3 boys). Our findings are also in line with a study conducted in another province in Zimbabwe and also findings from studies in Ghana and Nigeria (Midzi et al., 2011; Nkegbe, 2010; Amuta and Houmsou, 2014). However, the higher prevalence rates among girls may be explained by the different gendered roles and social responsibilities for boys and girls in the communities. Girls have a higher likelihood of contracting infection because household chores demand constant water contact (Amuta and Houmsou, 2014; Oluwasogo and Fagbemi, 2013). A relationship between prevalence of infection with age and sex, with males being more infected than females was recently reported (Amsalu et al., 2014). This finding is however contrary to our findings as girls were more infected and the infection increased with age. Studies in Uganda, Cot D’voire, and Nigeria also found that boys were more infected than girls (Amuta and Houmsou, 2014; Rubaihayo et al., 2008; Raso et al., 2005).

Gender differences were attributed to socio-cultural factors and the greater exposure of males to the schistosome parasites due to their water contact activities like fishing, swimming and farming in irrigation schemes (Midzi et al., 2011; Oluwasogo and Fagbemi, 2013).

Garba, however, found that school-aged children were more likely to experience both light and heavy infections of Schistosomiasis, as well as bladder and upper tract lesions, irrespective of their gender or village location (Garba et al., 2010). In Nigeria age, related prevalence varied between 44.9% and 70.5%, with the age group 1–5 years having the lowest prevalence (44.9%, 53/118) and the age group 11–15 years having the highest (70.5%); and a significant difference was observed in the prevalence of urinary schistosomiasis between the age groups (Amsalu et al., 2014).

In our study, children from Ntalale reported more interaction with water than their counterparts at Dombo primary school. A considerable number, 40.3% of children at Ntalale crossed a river without a bridge on their way to school, and 34.3% removed their shoes compared to 28% who did the same for Dombo. However, 71.7% of children at Dombo watered gardens in comparison with 58.1% from Ntalale but they used canal water. Our study is a clear indication that the children were using unprotected water sources which is a risk factor for schistosomiasis transmission. Rivers, dams and canals in endemic areas like Gwanda increase the children’s vulnerability to schistosomiasis infection. A high rate of schistosomiasis was reported in Sudan among children who used unprotected water sources (Abou Zeid et al., 2013).

Our study findings confirm that there are generally poor levels of knowledge of schistosomiasis among the children. Children in our study had misconceptions about the causes of schistosomiasis which included mosquitoes, flies and drinking dirty water. Midzi and others found that grade three children believed that schistosomiasis was caused by jumping over fire among other misconceptions (Midzi et al., 2011). A study by Midzi and colleagues on the same age group found that only 32% and 36% of the children in rural and farming communities knew about schistosomiasis respectively (Midzi et al., 2011). According to the children, parents were not disseminating information on schistosomiasis to their children. This could indicate a lack of knowledge by the parents as Amuta and Houmsou found that lack of knowledge among children was attributed to the illiteracy of parents and negligence among farmers (Amuta and Houmsou, 2014). This study was not able to establish the parents/guardians’ level of education from the children because of their ages. Schistosomiasis as a neglected disease might not be discussed home. Antwi and others also highlighted the unacknowledged impact of schistosomiasis among populations in Ghana (Antwi et al., 2014).

In our study, the few children who had suffered from schistosomiasis used the borehole as their main water source at home. It is known that boreholes do not harbour schistosomes but our study shows that these children come into contact with other unprotected water sources. Alemu reported that 89.5% of the population used protected springs, and these were significantly associated with schistosomiasis (Alemu et al., 2011). This could mean that even the slightest or infrequent contact with an infected water source is harmful enough to cause schistosomiasis. A study in Nigeria showed that out of a total of 150 children, 96.7% reported crossing streams, making that the most frequently reported water-contact activity (Amuta and Houmsou, 2014).

Majority of the children (66.67%) from both schools reported that they went swimming whilst 7 out of 9 children of those who had suffered from schistosomiasis had been involved in fishing. In a study of 3 primary schools in Sudan, Ismael and colleagues found that schistosomiasis was significantly associated with the frequencies of contaminated water contact, taking baths, swimming and they also found a significant correlation between self-reported haematuria and urinary
schistosomiasis (Ismail et al., 2014). Similarly, in Ethiopia an association between swimming in the river, use of unprotected water sources for domestic purposes, crossing the river with bare feet and fishing with S. mansoni infection was found (Alemu et al., 2011).

Our study found that the majority of children who had suffered from schistosomiasis were from Ntalale who lived close to water bodies. A report by the Ministry of Health and Child Care in 2011 highlights the link between proximity to infected water bodies and schistosomiasis infection (Zimbabwe National Health Profile, 2011). Thus, proximity to unprotected water bodies and using them regularly are factors worth considering when studying determinants of schistosomiasis. Proximity to a water source was found to be a risk factor where living closer to the valley was 1.81 times more risky than living farther (CI = 1.16–2.8) (Abou Zeid et al., 2013). A study in Mali on risk factors for Schistosomiasis transmission among school children aged 8–15 found vicinity to snail breeding sites as a high transmission risk (Dabo et al., 2015). Our study areas had canals which were used for irrigation and canals are habitats for snails. Our findings are consistent with a study in Kenya which found the construction of an artificial pathway as a risk for S. mansoni host snails as school aged children frequently came into contact with lake water (Nagi et al., 2014). Mugono and colleagues on their study on risk factors associated with S. mansoni in North-Western Tanzania among 774 school children aged 4–15 years in 5 primary schools found location of the school and involvement in fishing activities to be risk factors for S. mansoni transmission (Mugono et al., 2014). This implies that proximity and easy access to the unprotected water sources encourages more frequent visits and repeated exposure to the contaminated water which may lead to schistosomiasis transmission.

The majority of the children in our study did not have access to toilets at home. Our study found that school children travel long distances and there are no toilets and hence the tendency to use the bush system. Of the total of 120, 98 children (81.7%) of the children admitted to have used the bush for defecating purposes with 3 students stating that they had urinated in water bodies. In our study all the students who had suffered from schistosomiasis reported to have defecated in the bush. Absence of a toilet can be a risk factor for Schistosomiasis transmission as shown by higher transmission rates among children who did not use the toilets in the study by Raja’a and others (Raja’a et al., 2000). A similar finding was reported in another Zimbabwean rural and commercial farming area where a large proportion of children who reported non-use of toilets were infected with Schistosomiasis infection (Midzi et al., 2011).

The poor knowledge among the children about Schistosomiasis could have affected their health seeking behaviour. There could also have been underreporting. In our study some children believed that Schistosomiasis could not be treated as reported by the 35.2%. Kabateirene also found that case management in health facilities was poor as Schistosomiasis knowledge was not only low in the community but even among biomedical staff (Kabateirene et al., 2014).

5. Study limitations

The sample size was small and the children's self-reporting especially on the history of schistosomiasis infection could not be verified. A parasitological survey was not conducted because there had been a recent yearly Mass Drug Administration Programme following a national survey conducted in 2011.

6. Conclusion

The study shows that children at both schools are at risk of schistosomiasis transmission probably because of their limited knowledge, intense contact with natural water bodies and poor sanitation facilities. There could be under reporting of schistosomiasis due to limited knowledge and non-availability of diagnostic equipment at the local health facilities. There is need to raise awareness about schistosomiasis in schools and the community to reduce behaviours that may predispose them to risk of contracting schistosomiasis. Increasing coverage of functional toilets may reduce the risk of contracting schistosome infections. MDAs should be accompanied by health education to empower children to desist from risky behaviour.

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References


