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Knowledge, attitudes and practices related to schistosomiasis among school children of North Senegal

Abstract

Background: Schistosomiasis is a highly prevalent parasitic disease in Senegal. The early symptoms are haematuria and dysuria. Children's comprehension of the disease is fundamental to preventing the infection. The aim of this study was to investigate the knowledge, attitude and practices related to schistosomiasis among school children of two rural villages in North Senegal.

Methods: A cross-sectional study was conducted. Data about children's knowledge of schistosomiasis, behaviour and preventive measures were collected through a questionnaire.

Results: Questionnaire responses from 575 school children were analysed. Correct answers about risky behaviour for schistosomiasis were associated with early symptoms (p=0.010). Wearing shoes and washing hands with soap were associated with not having haematuria and dysuria (p=0.007 and 0.049 respectively). Playing in rivers was associated with the above-mentioned symptoms (p<0.001). Children who had good knowledge of schistosomiasis reportedly did not have symptoms (p=0.002). A logistic regression model showed that being a female (OR=0.35; p=0.01) or attending a primary school (OR=0.13; p<0.001) were significant predictors of a lower risk of the early symptoms of urinary schistosomiasis.

Conclusion: This study revealed that the level of knowledge among children in North Senegal about the cause, transmission, prevention and treatment of schistosomiasis warrants implementing educational intervention.

Keywords: knowledge, attitude, practices, schistosomiasis, Senegal, children

Introduction

Schistosomiasis, a neglected tropical disease, is a parasitic infection characterized by intestinal and urogenital forms. Schistosoma intercalatum, S. japonica, S. mansoni and S. mekongi cause the intestinal infection, while S. haematobium causes the urogenital form.[1]

This disease has infected 207 million people, mostly in Sub-Saharan Africa,[1, 2] causing a disability rate ranging from 0.5% to 15%.[3, 4] The prevalence in the north of Senegal was 61% for S. mansoni and 50% for S. haematobium.[5] For urinary schistosomiasis, the reported prevalence among children aged 7 to 15 years was 57.6%.[6] Children aged between 5 and 15 years have a higher infection rate, with a consequent reduction in the adult population.[3, 7–10] The reported risk of infection was higher in women, [5] but in other studies, [11, 12] male children were more likely to be infected than female children were.[8-10] Socio-economic status, level of education, and untreated water and sanitation were associated with transmission of the pathogens.[1]

In the paediatric population, the early symptoms of urinary schistosomiasis are haematuria, with prevalence ranging from 15.8% to 52.4%,[13, 14] and dysuria, ranging from 19.5% to 54.3%.[15] Urinary schistosomiasis is a debilitating chronic illness that causes hydronephrosis, and sequelae such as bladder calcification and bladder cancer. It also increases the risk of HIV infection.[14, 16] The main consequences of this public health challenge are disturbed growth, impaired cognitive development and reduced capacity to work.[17]

Three diagnostic methods have been reported as effective. The microscopic detection of eggs in urine is considered the gold standard. Indirect diagnosis can be performed with haematuria dipsticks or simple questionnaires. These tools are easy and inexpensive for rapid screening in endemic areas.[7] The World Health Organization (WHO) recommends questionnaires as the first step in controlling schistosomiasis.[13, 18]

The intervention strategies for this disease are safe water, hygiene, education and preventive treatment with praziquantel.[1] In particular, inculcating the habit of washing hands with soap and playing away from rivers and other water sources is fundamental.[14, 19] Working and playing near a river was significantly associated with S. haematobium infection.[10, 20] Another important strategy is fostering knowledge about the disease. In a Zimbabwe study in 2011, Midzi et al. reported that 32% of children knew the causes of schistosomiasis and 22% knew the preventive actions. A questionnaire that targets knowledge, attitudes and practice (KAP)

is the most recognized method for investigating awareness around disease. [8, 9, 10, 21]

To our knowledge, no studies have used KAP for schistosomiasis in northern Senegal. Thus, the aim of this study was to describe the knowledge, attitudes and practices around the early symptoms of schistosomiasis among school children in two rural villages in North Senegal.

Materials and Methods

Location

This cross-sectional study recruited primary and secondary school children in Kassak North and Kassak South. Kassak North is one of the largest villages in the Saint Louis region in northern Senegal, with 3,200 inhabitants. Not far from Kassak North, Kassak South has 1,390 inhabitants. Both villages have primary schools. The students progress to a secondary school in Kassak North. Both villages have a power supply, but it is not available to the whole village. Chlorine-treated, chargeable water is conveyed from the river to the mainly brick or mud-and-straw houses through municipal pipelines. Each village has a health post run by a nurse and a maternity service managed by matrons. The nearest clinic is 40 km away, and the nearest hospital is 75 km away. Both villages are near a stream. At Kassak South, the stream is less accessible due to irrigation dams.

Data collection

In this study, the knowledge, behaviour and preventive measures around schistosomiasis were investigated. Socio-economic data and data about the presence of haematuria and dysuria in the previous month were collected, as reported by children.

Local residents helped to improve the readability and comprehensibility of the questionnaire, which pooled 22 queries that followed examples in the literature. All items were in a ‘yes’ or ‘no’ format. The present authors tested the questionnaire among 10 school children to evaluate its readability, clarity and conciseness. The questionnaire was then approved by directors and teachers, and administered during school classes over three days in May 2014. Teachers actively helped the researchers to administer the questionnaire.

Statistical Analysis

Statistical analysis was carried out using STATA V.13 (Stata Corp, College Station, Texas, USA, 2013). A descriptive analysis of the sample was conducted, according to the presence

of the early schistosomiasis symptoms (haematuria and dysuria) and considering the distribution of gender, class, village, school, knowledge of schistosomiasis, previous diagnosis of schistosomiasis and socio-economic status. Results were expressed in frequencies and percentages. Finally, multivariate analysis was conducted using a logistic regression model to assess the potential predictors of early symptoms of urinary schistosomiasis. The results were expressed as odds ratios with 95% confidence intervals, and a two-tailed probability value of less than 0.05 was considered significant.

Categories

The socio-economic status was identified by the ownership of ten goods (concrete house, radio, television, refrigerator, fan, water pump, bicycle, motorcycle and car) and their relative frequencies of distribution among the population. The scores, which ranged from 0 to 5.5 points, were categorized in three socio-economic classes as follows: low (0–1.5 points), medium (1.6–3.0 points) and high (3.1–5.5 points).

The present authors collected and categorised the children's knowledge of risky behaviour related to schistosomiasis. The six questions were: 1) Do you wear shoes? 2) Do you wash your hands before eating? 3) Do you wash your hands after defecation? 4) Do you wash your hands with soap? 5) Do you play at the river? 6) Do you use water from the river? The authors created a variable called 'correct answers on risky behaviour', which used four categories: a) all answers were correct; b) 4–5 answers were correct; c) 2–3 answers were correct, and d) 0–1 answers were correct.

To investigate the children's knowledge about schistosomiasis prevention, the present authors asked the children, 'How can you be infected by schistosomiasis?' and offered the following answers: 1) Playing in the river; 2) Drinking salt water; 3) Eating a lot of salt; 4) Through worms in the water; 5) Entering the toilet without shoes; 6) Through snails; 7) Stepping on urine; 8) Eating green mangoes; 9) Playing with fire; 10) Not wearing shoes; 11) Walking in a place with bad entities; 12) Urinating in water. The authors called the variable 'correct answers on prevention of schistosomiasis' and sorted the answers into three categories of knowledge: good (10–12 correct answers), medium (7–9 correct answers), and poor (0–6 correct answers).

To investigate the children's knowledge about treatment for schistosomiasis, the authors asked 'What can you do if you are infected by schistosomiasis?' and offered the following

answers: take medication, go to the health office, take herbs, boil the roots of plants. A variable called 'correct answers on treatment of schistosomiasis' was created, identifying three categories of knowledge: good (4 correct answers), medium (2–3 correct answers), and poor (0–1 correct answers).

Ethical approval

Ethical approval was obtained from the National Ethics Committee for Health Research of the Ministry of Health and Social Action in Senegal.

Results

The sample included 575 school children. No child refused to participate in the study. Of the participants, 275 were male (48.4%), and 293 (51.6%) were female. The mean age of the sample set was 13.1±2.5 years (range 7–20 years). Most of the children (327; 58.9%) lived in Kassak North, followed by 159 (28.7%) in Kassak South, and 69 (12.4%) in other villages. The number of males who reported that they had been infected by schistosomiasis (195, 82.3%) was higher than the number of females who reported they had been infected (172; 67.9%) (p=0.001).

Haematuria and dysuria were reported to have been higher during the previous month in male children than in female children. Haematuria was reported by 156 (58.9%) boys and 137 (48.6%) girls (p=0.016). Dysuria was reported by 129 (49.1%) boys and 109 (39.1%) girls (p=0.019). The percentage of boys who declared that they played in the river was higher than for girls (66.54% vs. 56.99%; p=0.022).

Table 1 presents the characteristics of the sample set, analysed according to the early symptoms of urinary schistosomiasis. Male children reported the early symptoms of urinary schistosomiasis (haematuria + dysuria) significantly more often than female children reported them (p=0.010). Residency in North Kassak was also associated with haematuria and dysuria (p<0.001). Knowledge of schistosomiasis and a previous diagnosis were associated with early symptoms (p=0.013 and p<0.001, respectively).

Table 2 presents the behaviour that the children reported. Correctly answering all the questions around risky behaviour was associated with early symptoms (p=0.010). Wearing shoes and washing hands with soap were associated with absence of haematuria and dysuria

(p=0.007 and p=0.049 respectively), while playing in the river was associated with the symptoms (p< 0.001).

The majority of the children had good or medium knowledge about preventive behaviour (77.2%). Almost all the children (90.4%) knew that playing in the river was risky. Most (63.6%) understood that urinating in water was risky behaviour and that the infection could be caused by worms (66.1%) and snails (40.5%). One third of the children (33.5%) knew that not wearing shoes and stepping in urine (31.4%) were bad behaviour. A minority of children still believed popular myths, for example, that stepping in a witch's place (18.3%), eating green mangoes (15.8%) and playing with fire (11.2%) would cause schistosomiasis. Most of the children (91.1%) had good or medium knowledge about the treatment for schistosomiasis. In particular, 96.0% of the children knew that taking medication would help heal the disease, and 95.1% knew that going to the health centre was correct.

Table 3 reports the knowledge of prevention and treatment for schistosomiasis among the children who reported having the symptoms of the disease. The majority thought that people acquired schistosomiasis by eating a lot of salt or green mangoes (p=0.013 and p=0.001 respectively). Children with symptoms also believed that playing with fire and stepping in places where witches lived could cause schistosomiasis. (p<0.001). There was a significant association between children who reported playing in the river (p=0.014) or entering the toilet without shoes and the presence of schistosomiasis symptoms (p<0.001). Finally, the knowledge that snails host Schistosoma was associated with haematuria and dysuria (p<0.001). Children who had good knowledge of the treatment of schistosomiasis did not report symptoms (p=0.002).

The logistic regression model of the multivariate analysis (Table 4) showed that being a female (OR=0.35; p=0.01), attending a primary school (OR=0.13; p<0.001) and living in Kassak South (OR=0.45; p=0.024) were significant predictors of a lower risk of the early symptoms of urinary schistosomiasis. The analysis also revealed that poor knowledge of the treatment of schistosomiasis was associated with a higher risk of early symptoms of infection (OR=6.06; p=0.001).

Discussion

The aim of this study was to describe the knowledge, attitudes and practices (KAP) associated with schistosomiasis-related early symptoms in school children of two rural

villages in North Senegal. KAP is investigated widely in developing countries. KAP of hygiene is essential in African countries.[10, 22] Other studies have used KAP surveys to inquire into schistosomiasis among school children. In particular, Midzi et al. [9] evaluated KAP about schistosomiasis, malaria and soil-transmitted helminthiasis in primary school children, while Suzuki et al. used a similar survey in Zimbabwe in 2005. [23] KAP investigations have been used in relation to schistosomiasis in other countries, such as Kenya, Cote d'Ivoire and Ethiopia.[10, 24, 25]

Questionnaires have been used for diagnostic screening of schistosomiasis for decades.[13, 26] As reported in the literature, questionnaires are one of the best approaches for field use when diagnosing infectious disease.[27] In this study, school directors and teachers helped improve the effectiveness of the survey. [18]

Some studies have assessed the validity and reliability of questionnaires as they related to schistosomiasis, but most of these looked only at haematuria and did not include dysuria.[13, 18, 20] Gryseel [9] specified that the early symptoms of urinary schistosomiasis in school children are haematuria and dysuria. Accordingly, this study investigated both symptoms.

This study confirmed earlier research [10, 11] that indicated male children were exposed to the disease more than female children, according to reported infection by schistosomiasis and the presence of haematuria and dysuria. Boys played in the river more than girls did, confirming previous studies that reported that playing in the river was associated with the infection.[6, 10, 20] The importance of living close to the river as a risk factor for schistosomiasis was confirmed in our study. Children living in Kassak North, where the river was more accessible, reported more schistosomiasis than did the children who could not approach the river as easily.[12]

Unlike other studies, [1, 12] socio-economic status was not associated with the presence of symptoms in this investigation.

This study observed that washing hands without soap before eating and after defecation increased the likelihood of the infection, which was in line with other studies. [19, 28]

Wearing shoes was associated with less schistosomiasis in this study. Alemu et al. reported similar results. [29]

As noted, the potential predictors of early symptoms of schistosomiasis were related to the demographic characteristics of the study population. Knowledge about disease treatments

could be considered a high potential predictor. Compared to the population investigated in the Midzi et al. study [9] that was conducted in Zimbabwe in 2011, the children sampled in this work reported more knowledge about the prevention and treatment of schistosomiasis. Unexpectedly, in this study, knowing what schistosomiasis was and a previous schistosomiasis infection were not potential predictors. [9, 10]

Limitations

Further studies with a larger sample should re-evaluate these results. The alleged difficulty of some children in responding to the questionnaire was critical. The teacher's help may have influenced some of the answers.

Conclusion

This study revealed that the level of knowledge among children in North Senegal about the cause, transmission, prevention and treatment of schistosomiasis warrants implementing educational intervention.

Recommendation

Increasing knowledge among children about schistosomiasis is fundamental for the eradication of the disease. All forms of interventions, for children and adults, should be integrated and include pharmacological treatment, infrastructure improvements and health education. Future research should include social science approaches, for example, exploring the cultural significance of waterways.

Table 1. Description of the sample according to the early symptoms of urinary schistosomiasis

Characteristic		**Early symptoms of urinary schistosomiasis[a]**		
		No; % (N)	Yes; % (N)	p
Sex	Males	44.28 (151)	55.78 (111)	0.010
	Females	55.72 (190)	44.22 (88)	
Age in years (mean± *SD)*		12.04 ± 2.11	13.92 ± 2.44	<0.001
School level	Primary	35.59 (121)	82.76 (168)	<0.001
	Secondary	64.41 (219)	17.24 (35)	
Residence	Kassak North	51.92 (176)	69.27 (133)	<0.001
	Kassak South	32.45 (110)	22.92 (44)	
	Other	15.63 (53)	7.81 (15)	
School place	Kassak North	81.63 (280)	83.74 (170)	0.531
	Kassak South	18.37 (63)	16.26 (33)	
Knowledge of schistosomiasis	Yes	82.18 (272)	90.21 (175)	0.013
Previous infection by schistosomiasis	Yes	67.50 (216)	90.32 (140)	<0.001
Socio-economic status	Poor	45.90 (140)	51.59 (81)	0.196
	Medium	36.39 (111)	28.03 (44)	
	High	17.70 (54)	20.38 (32)	

a. Numbers/percentage may not add up to the total number due to missing data

Table 2. Description of practice related to schistosomiasis according to the self-reported haematuria

		Early symptoms of urinary schistosomiasis[a]		
Children in this category answered 'yes' to these questions about preventive methods:		**No % (N)**	**Yes % (N)**	**p**
Do you wear shoes?		97.34 (329)	92.27 (179)	0.007
Do you wash your hands before eating?		98.51 (331)	97.37 (185)	0.356
Do you wash your hands after defecation?		94.61 (316)	91.35 (169)	0.151
Do you wash your hands with soap?		81.68 (272)	74.32 (136)	0.049
Do you play in the river?		51.93 (175)	77.49 (148)	<0.001
Do you use river water?		76.65 (256)	73.26 (137)	0.389
Score:	All answers correct	28.66 (90)	43.03 (71)	0.010
	4-5 correct answers	67.20 (211)	52.12 (86)	
	2-3 correct answers	3.82 (12)	4.85 (8)	
	0-1 correct answers	0.32 (1)	0.00 (0)	

a. Numbers/percentage may not add up to the total number due to missing data

Table 3. Knowledge about prevention and treatment of schistosomiasis, according to whether the children did or did not have symptoms of the disease.

Children in this category answered 'yes' to whether they could be infected with schistosomiasis:		**Early symptoms of urinary schistosomiasis[a]**		
		No% (N)	**Yes % (N)**	**p**
Playing in the river		88.76 (300)	95.00 (190)	0.014
Drinking salt water		44.28 (147)	43.62 (82)	0.884
Eating too much salt		11.25 (37)	19.15 (36)	0.013
From worms in the water		63.66 (212)	70.43 (131)	0.118
Entering the toilet without shoes		25.60 (85)	44.04 (85)	<0.001
From snails		32.83 (109)	51.35 (95)	<0.001
Stepping in urine		26.75 (88)	34.76 (65)	0.055
Eating green mangoes		10.33 (34)	21.28 (40)	0.001
Playing with fire		6.21 (21)	15.87 (30)	<0.001
Not wearing shoes		16.86 (57)	22.11 (42)	0.139
Stepping in a witch's place		11.11 (37)	27.37 (52)	<0.001
Urinating in water		60.65 (205)	68.78 (130)	0.063
Score for prevention knowledge:	Good	6.86 (19)	11.43 (16)	0.083
	Medium	68.23 (189)	71.43 (100)	
	Poor	24.91 (69)	17.14 (24)	
Children in this category answered 'yes' to whether they could treat schistosomiasis by these methods:				
Take medication		97.37 (333)	95.34 (184)	0.211
Go to the health centre		97.37 (333)	91.75 (178)	0.003
Take herbs		7.96 (27)	17.62 (34)	0.001
Boil herbal roots		15.29 (52)	21.99 (42)	0.052
Score for treatment knowledge:	Good	78.34 (264)	64.84 (118)	0.002

	Medium	15.73 (53)	21.98 (40)
	Poor	5.93 (20)	13.19 (24)

a. Numbers/percentage may not add up to the total number due to missing data

Table 4. Potential predictors of early symptoms of urinary schistosomiasis

Characteristic		**OR adjusted**	**IC (95%)**	**p**
Sex	Males	Ref	-	-
	Females	0.35	(0.19–0.65)	0.001
School class	Primary	Ref	-	-
	Secondary	0.13	(0.06–0.25)	<0.001
Residence	North Kassak	Ref	-	-
	South Kassak	0.45	(0.23–0.90)	0.024
	Other	1.14	(0.48–2.72)	0.770
Do you know schistosomiasis	Yes	1.44	(0.67–3.09)	0.355
Have you been infected by schistosomiasis	Yes	1.83	(0.95–3.54)	0.071
Correct answers on risk behaviour	All answers correct	Ref	-	-
	4-5 correct answers	1.01	(0.54–1.89)	0.978
	2-3 correct answers	0.87	(0.14–5.24)	0.875
	0-1 correct answers	-	-	-
Socio-economic status	Poor	Ref	-	-
	Medium	1.05	(0.54–2.02)	0.893
	High	0.90	(0.41–1.99)	0.793
Prevention of schistosomiasis	Good knowledge	Ref	-	-
	Medium knowledge	1.37	(0.45–4.20)	0.584
	Poor knowledge	1.05	(0.31–3.56)	0.941
Treatment of schistosomiasis	Good knowledge	Ref	-	-
	Medium knowledge	1.19	(0.55–2.59)	0.654
	Poor knowledge	6.06	(2.04–17.94)	0.001

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