Research Article

Schistosomiasis Is an Illness of People: Understanding Knowledge, Attitudes, and Practices in Torrock, Chad

Didier Lalaye[1], Akinyinka Akinyoade[2], Tom PVM de Jong[3,4], Mirjam de Bruijn[5]

1. Julius Global Health Centre, University Medical Center Utrecht, Utrecht, Netherlands; 2. African Studies Centre, Leiden University, Netherlands; 3. University Children's Hospitals UMC Utrecht, University Medical Center Utrecht, Utrecht, Netherlands; 4. Amsterdam University Medical Centers, Amsterdam, Netherlands; 5. History Institute and African Studies Centre, Leiden University, Netherlands

Schistosomiasis is a waterborne parasitic disease with a significant impact on public health, particularly in sub-Saharan Africa. This article presents a study conducted in the endemic region of Torrock, Chad, to explore the potential of mobile health (m-health) interventions in combating the disease. Despite the availability of a simple treatment, praziquantel, and various attempted strategies including mass drug administration and snail control, the disease continues to persist. The study focuses on understanding the local population's knowledge, attitudes, and practices related to schistosomiasis and its transmission.

The research found that m-health initiatives not only contributed to treatment but also played a crucial role in sensitizing the population about the disease. The study emphasizes that effective disease control requires not only medical treatment but also changes in social attitudes and behaviours within the context of local culture and customs. The findings highlight the importance of local perceptions and how information is disseminated to enhance treatment acceptance.

Schistosomiasis, caused by parasitic worms of the genus Schistosoma, is transmitted through contaminated water. The disease's lifecycle involves humans, snails, and water sources. The article discusses the introduction of an m-health system in Torrock, enabled by mobile phone technology, which allowed for home-based urine testing and treatment distribution. Despite the system's implementation, limited understanding and awareness of the disease persisted in the region.

The study employed a questionnaire-based survey that collected data on respondents' demographic information, disease knowledge, attitudes, practices, and water sources. The results revealed variations in knowledge based on gender, age, education level, and occupation. Females exhibited more in-depth knowledge, while higher education levels corresponded to better disease awareness.

 doi.org/10.32388/XACQSS

Additionally, traditional beliefs, poor water sources, and limited access to safe water contributed to the disease's persistence.

In conclusion, the article highlights the need for context-specific interventions and the integration of cultural and behavioural factors in disease control strategies. By understanding local perceptions and engaging the population through m-health initiatives, there is potential for achieving greater success in combating schistosomiasis and other similar diseases in endemic regions. This research underscores the importance of community engagement and holistic approaches in the fight against neglected tropical diseases.

Corresponding author: Didier Lalaye, lalaye84@gmail.com

Introduction

Schistosomiasis is a parasite that causes severe illness in people. It is transferred in water, via a snail who is the carrier of the parasite, which enters the body of à human being via the skin. The illness that is caused by the parasite can be treated with praziquantel. It is an easy treatment. The consequences of the infection, caused by the parasite, when not well treated, can be untimely death. Some parts of Africa, among which Southern Chad are confronted with this disease and there has so far not been a solution to eradicate the illness. We have set up an approach to the illness triggered by the introduction of mobile telephony in Africa. As the treatment of the illness is easy, with a one-vector treatment, the essential part is to detect the infection in time and give the right dose of praziquantel.

However, treating the illness only according to clinical reasoning has proven insufficient to eradicate Schistosomiasis. Studies have shown that the various approaches to eradicate S. have not been successful. Examples are the return of S after mass treatment, the insufficiency of the treatment directed to individuals, and the biological approach to control the vector of the illness: the snails, which has not had the hoped-for impact [1][2][3]. The result is that in many regions of sub-Saharan Africa Schistosomiasis still has a high prevalence (reference??). One of the conclusions from the literature is that most approaches to S. are medical and do not take the social-cultural factors that define acceptance of treatment of an illness into consideration. This is certainly the case for Schistosomiasis, a disease related to the environment, especially water where the snails' carriers of the parasites live. Skin contact with contaminated water is one of the main reasons that people get infected. It is not easy for the population in these areas to change their behaviour vis-à-vis their water environment as there are no other

alternative water sources essential for their livelihoods. Hence the medical approach alone will not eradicate S.

Our experiment/project in Chad (explanation follows below) was an attempt to understand if and how m-health could be part of the solution to this problem. We concluded that m-health approaches could be effective in the eradication of Bilharzias. But there are still obstacles to overcome. One of our findings showed that the effect of the introduction of m-health was probably not only the treatment of the illness but especially the sensitization of the population [4]. Is it not so that to treat such endemic disease people in the endemic area should accept the treatments, and treatments must be developed with local culture and customs in mind [5]? To increase effectiveness, we need to understand how people perceive the illness and how they react to the information that is given about it through the project.

This study was executed in Chad, where Bilharzia is an endemic disease. It has been shown that treatment of a disease includes medical treatment but certainly also changes in social attitudes towards the illness and behaviours that influence the attraction of the disease. We carried out this survey on knowledge attitudes and practices related to bilharzia to better understand why the illness is so widespread, as we have found in our studies on the prevalence of Bilharzia in the study region.

The hypothesis behind this study posits that in endemic areas for Schistosoma, inadequate excreta management and insufficient access to safe water will contribute to the increased prevalence of parasitosis. In endemic areas, particularly those with limited education, are unavoidably exposed to contaminated water, while those with higher education levels are more likely to embrace Western medical explanations; conversely, less educated individuals are expected to be more inclined towards local interpretations, and it further suggests that there is no discernible correlation between age or gender and the levels of knowledge, attitudes, and practices concerning schistosomiasis.

We did this study to improve the understanding of how to set up an effective m-health system for the treatment of S. in the future.

Background: The disease

Schistosomes are parasitic flatworms of the genus *Schistosoma*, which reside in human blood vessels [6]. Adult worms measure 1-2 cm in length and possess cylindrical bodies with two terminal suckers, a specialized tegument, a blind-ended digestive system, and reproductive structures. The male features a

ventral groove, known as the gynaecophobia canal, where it permanently holds the slenderer female. These worm pairs inhabit the peri vesical venous plexus in the human host [7].

In the case of *Schistosoma haematobium*, the female produces hundreds of eggs daily throughout her lifespan. The eggs, identifiable by their terminal spine and dimensions of approximately 144x58 µm, penetrate the bladder wall to be expelled in urine. Each egg carries a ciliated larva, the miracidium, which secretes enzymes facilitating its passage into the bladder. However, a significant portion of eggs fails to reach the bladder lumen. These eggs may either circulate in the bloodstream or become lodged in tissues, where they trigger a granulomatous immune response, which is the primary cause of disease pathology.

Once excreted, the eggs hatch upon contact with freshwater, releasing miracidia. These larvae, viable for up to 48 hours, actively seek out suitable intermediate snail hosts, such as *Bulinus* species, using light and chemical cues. Inside the snail, miracidia undergo asexual reproduction, producing generations of sporocysts. Over time, these give rise to thousands of infective larvae called cercariae, which emerge from the snail over several weeks and may continue shedding for months. Cercariae, capable of surviving up to 72 hours, responds to water movement and skin-derived chemicals to locate a human host. They penetrate the skin within minutes, shed their tails, and travel via the bloodstream through the lungs to the liver. There, they mature and mate in the portal vein before migrating to the peri vesical venous plexus. Egg production typically begins 4-7 weeks post-infection. Adult worms usually live for 3-5 years but may survive up to 30 years in some cases [8].

Transmission of schistosomiasis relies on three main factors: contamination of freshwater with feces or urine containing eggs, the presence of specific freshwater snails, and human exposure to water containing infectious cercariae [9].

In response to the disease burden, our earlier work [5] described the implementation of an innovative health delivery model using mobile phones and SMS relay systems. The approach enabled urine sample collection at home, diagnostic testing at a newly established village laboratory, and direct delivery of praziquantel to the homes of infected children. This Mobile Health initiative, launched in 2015 in Torrock —an endemic village in central Chad—aimed to address the healthcare access gap [5].

Despite these efforts, no ethnographic research had been conducted in the region until recently. The only prior survey conducted in 2009, revealed a significant lack of awareness: 85.6% of respondents did not know the cause of the disease, 72.6% were unaware of its complications, and 67.9% did not understand how it was transmitted [10].

Justification of the Study

Very few studies have been conducted on the knowledge, attitudes, and practices related to the bilharzia disease in general, especially in Chad where only one study was conducted in 2009 as stated above [10]. The beliefs of the population about the disease could contribute to putting in place adequate strategies for a rapid decline of the prevalence in endemic areas if they are well informed. That is why we have decided to do this survey.

Hypothesis

People who live in endemic areas for S. without proper management of excreta and the lack of safe water in sufficient quantities will promote the expansion of parasitosis.

The livelihood of most people in the endemic areas is such that they cannot avoid being in touch with contaminated water.

People with a higher education level will be more inclined to accept the Western medical explanation of S.

People without education will be more inclined to accept the local explanations of S.

There is no correlation between age and/or gender and level of knowledge, attitudes, and practices on schistosomiasis.

Objectives

Main objective

To evaluate the knowledge, attitudes, and practices of the population of Torrock towards schistosomiasis and the contact of this population with the environmental favouring factors.

Specific objectives

- To determine the population's knowledge of schistosomiasis.
- To determine the attitudes of the population to schistosomiasis
- To determine the behaviour of the population to schistosomiasis.
- To identify risk factors related to the transmission of the disease.
- To describe the level of knowledge on the different types of treatment and their effectiveness.

Materials and Methods

Survey

This survey is intended for the entire population of the sub-prefecture of Torrock from the age of 18 years old and more can give information. The survey is based also on earlier observations of the research team.

The questionnaires have three parts:

Socio-demographic data (age, gender, occupation, education level)

the understanding of the illness in different belief systems (from medical to traditional to religious)

Knowledge of the diverse types of treatment and their efficacy. The questions were either multiple responses or single answers.

Lifestyle: water supply, waste management, and socio-economic livelihood.

Methodology

Description of the study

- *Study Population*: Any person living in the sub-prefecture of Torrock aged over 18 years.
- *Study period*: This study was conducted from 6 to 25 May 2019.
- *Type of study*: This was a prospective, descriptive, cross-sectional study, to assess the knowledge about S. of the population in Torrock.

Sampling

We have used a non-exhaustive sampling by selecting people; people who met the inclusion criteria were taken into consideration through random selection. The commitment to the study was voluntary; we questioned a total of 310 people.

The most used formula (as it does not reflect the total population) to calculate the minimum sample size, is as follows: $\mathrm{N} = \frac{z^2 p(1-p)}{c^2}$

With: N = sample size; Z = value corresponding to a given confidence level (1.96 for a confidence level of 95 %); p = percentage of the main indicator, expressed in decimal; c = standard error, expressed in decimals (0.05).

In our study, p = 0.21, so the minimal size of the sample N = 255.

Inclusion criteria

- Being 18 years old at least
- Being a resident of Torrock

Agreeing to participate in the survey, with a note of consent was required for adult participants. For minors, an agreement with their parents was required.

Techniques

The survey was done with the questionnaire on paper, and we allowed for further discussions if this was appropriate. The data were collected by a medical doctor, an anthropologist, a nutritionist, and a nurse who works in the m-health project.

The study was conducted in two phases:

- A pre-survey phase was developed to test the questionnaire for validation. The pre-test questionnaire was made with ten[10] randomly selected people.
- Following this, questions were removed, and others were modified and used to assess the knowledge of the respondents.

A questionnaire beforehand has been developed and adapted in Moundang (the native language in Torrock and spoken by other social groups in the area) and was used as a data collection instrument that took place in health centres, markets, and sometimes in private homes and public places. Schistosomiasis is known as the *"teutchoum chign"* in Moundang, which literally means "red urine". This semi-structured questionnaire was administered to the subjects of our sample following their consent.

Processing and analysis of data

The database was made in Excel, and the analysis was performed by SPSS software version 25. Test χ^2 and Exact Fischer were the main statistical tests used for variable interest at 95% significance.

Ethical aspects

This study involved minimal risk and relied on anonymized data collected during a public health survey. In compliance with institutional and local regulations, an exemption certificate was granted by the National Bioethics Committee of Chad. Written individual informed consent was not required,

nevertheless the study framework was explained to participants and/or their parents who were asked for their oral consent. They were all notified that participation in this study was voluntary and without constraint.

The study protocol was approved by the medical doctor who is the head of the District of Torrock. Then a first contact was established with health authorities and traditional leaders.

Results

Total survey participants: 310

The distribution according to age has been done in 4 main groups: 18 to 20 years, 21 to 30 years, 31 to 40, and 41 and more.

The level of education has been noted as "no" (for people who have never been enrolled in school), primary, secondary, or higher education.

Regarding the answers on the knowledge of schistosomiasis, the correct answers (the answers were compared with the medical standards; people who did not follow these standards were coded with 0, and those with correspondence to medical explanations were coded with 2) were scored 2 when the answer had more than one component like symptoms or complications, 0 for wrong answers and "I do not know", translated into 0 score too. For this component, the results were given according to gender, age, occupation, etc. first and then, a total score of general knowledge was assigned. There were 5 questions for the knowledge part, so the maximum points can only be 10. A score of 8 to10 points represents high knowledge, average is of 5-7, and poor knowledge, 0-4.

Socio-economic background	Knowledge (%)			Total % (N)
	Low	Medium	High	
Gender				
Male	33.3	56.8	9.9	42.4 (111)
Female	21.2	57.6	21.2	57.6 (151)
Age of respondents				
18-20	33.3	62.6	4.4	34.7 (91)
21-30	23.0	63.5	13.5	28.2 (74)
31-40	29.6	44.4	25.9	20.6 (54)
41+	14.0	51.2	34.9	16.4 (43)
Level of education				
No education	57.1	38.1	4.8	16.0 (42)
Primary	25.5	62.7	11.8	19.5 (51)
Secondary	20.9	62.2	16.9	56.5 (148)
Tertiary	4.8	47.6	47.6	8.0 (21)
Profession				
Breeder	55.6	38.9	5.6	6.9 (18)
Farmer	12.7	63.6	23.6	21.0 (55)
Health worker	0.0	33.3	66.7	4.6 (12)
Household	53.6	46.4	0.0	10.7 (28)
Other	7.1	57.1	35.7	5.3 (14)
Retiree	62.5	37.5	0.0	3.1 (8)
Seller	0.0	100.0	0.0	1.1 (3)
Student (PS)	100.0	0.0	0.0	1.5 (4)
Student (SS)	25.7	67.3	6.9	38.5 (101)

Socio-economic background	Knowledge (%)			Total % (N)
	Low	Medium	High	
Student (U)	0.0	62.5	37.5	3.1 (8)
Teacher*	9.1	36.4	54.5	4.2 (11)
Total	26.3	57.3	16.4	100 (262)

Table 1. Distribution of respondents according to knowledge of schistosomiasis

Source: Primary data, Torrock 2019.

According to the respondents' gender, females have more in-depth knowledge of schistosomiasis than males.

In terms of age distribution, persons in the older age group 41 years and above (34.9%) also displayed more knowledge of the disease, compared to 4.4% among respondents aged 18-20 years.

Furthermore, a positive relationship was also observed between the level of education and knowledge of schistosomiasis; that is, the higher the level of education of respondents, the more they appear to know about the disease.

Knowledge of schistosomiasis varies according to the profession of the respondents. Farmers have better knowledge of the disease than pastoralists; students at higher levels of education know more than those with basic education; and unsurprisingly, healthcare workers and teachers demonstrated quite high degrees of knowledge of the disease.

Background	History (%)			Total
	Do not know	No	Yes	
Gender				
Female	7.2	27.0	65.8	42.4% (111)
Male	2.0	17.2	80.8	57.6% (151)
Age				
18-20	3.3	16.5	80.2	34.7 (91)
21-30	2.7	14.9	82.4	28.2 (74)
31-40	7.4	22.2	70.4	20.6 (54)
41+	4.7	41.9	53.5	16.4 (43)
Total	4.2	21.4	74.4	(262)

Table 2. Distribution of respondents by gender & age according to Schistosomiasis contraction history

Respondents in Torrock were asked if they had ever contracted Schistosomiasis; this proportion is higher for males than for females. About 80% of all males stated that they have had schistosomiasis at least once, compared to a lower proportion of females (65.8%).

With reference to the age group of respondents, an inverse relationship was observed with having ever had schistosomiasis. The largest proportion, which is 80.2% of those that have ever had it are among the youngest respondents aged 18-20 years; while among the respondents aged 41 years and over, about half (53.5%) have ever been infected.

Gender	Treatment profile (%)				Total % (N)
	Western	Local	Both	No	
Female	51.4	35.1	2.7	10.8	37.8 (74)
Male	55.7	26.7	4.9	10.7	62.2 (122)
Total	54.1	31.1	4.1	10.7	(196)

Table 3. Percentage distribution of respondents by gender according to treatment sought.

Source: Primary data, Torrock 2019

Among respondents that have ever been infected with schistosomiasis, information about their sources of treatment shows that half of the respondents have used Western medical treatment, approximately one-third resorted to locally generated medicine, while fewer than 5% of respondents used both the Western and local medical intervention at the same time. However, a sizable proportion of the population (10%) have not sought treatment.

History of water use	Source of water			Total
	Pump well	Traditional well	Both	
Don't know	6	5	0	11 (4.2%
No	36	15	5	56 (21.4%)
Yes	100	64	31	195 (74.4%)
Total	142 (54.2%)	84 (32.1%)	36 (13.7%)	262

Table 4. Distribution of Schistosomiasis history according to water source (p=0.23)

Slightly above half of respondents use pump wells.

Just about one-third of respondents draw water from traditional wells, and a little bit over 10% of respondents access water from both the traditional wells and pump wells.

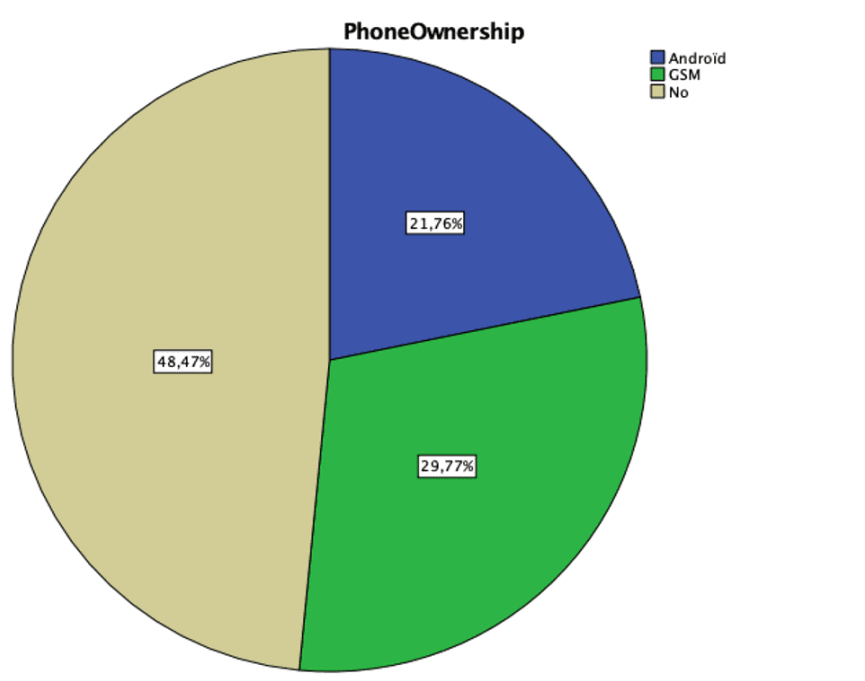

Figure 1. Percentage distribution of respondents according to mobile communications penetration in Torrock

In Torrock, slightly over half (51.5%) of the respondents use mobile telephones.

Discussion and Comments

Knowledge of schistosomiasis

In our study, in general, only more than 16% of the population have a high knowledge of schistosomiasis and most of them indicated that they have learned about it thanks to Dawa Mobile Health, the mobile health system in the region. Nkechi G. and al. in 2010 Nigeria found that in Akwuadu, the community members indicated ignorance of the disease until officials from the Ministry of Health carried out an investigation using school-age children in the community (Perceptions, attitudes, and practices on schistosomiasis in Delta State, Nigeria)[11]. In Torrock, the population interprets Schistosomiasis in their language as “teu tchàum syii”, which is literally "red urine". Bilharzia is commonly identified and

described by the red colour of the patient's urine; This pathology is understood not directly by its causes, but by its somatic and violent consequences (symptoms) on the human body, hence its identification in relation to urine-taking an abnormal red colour that alludes to blood. If there is no blood in the urine, Schistosomiasis is unfortunately not suspected[12]. Such an apprehension of urinary schistosomiasis from the red colour of urine is also observed in Mali where the Dogon population identifies this pathology by the term *mogo banu*, that is to say, *"red mogo(mogo=urine)"* because of the bloody appearance of the patient's urine. However, in other Dogon populations such as the Dogolu, "the red mogo" is not seen as a disease but as a sign of child fertility. For them, a young boy who is not "affected" could be sterile. The red urine is then assimilated to "men's periods"(Tinta, 1999: 7). In our study, the main cause of schistosomiasis explained by a large part of the local population is linked to the sun; they believe that walking or working for a long time in the sun causes bilharzia. Studies done in areas with an elevated level of awareness of schistosomiasis show an in-depth understanding of the knowledge; Ndamba et al. reported that 80% of villagers in Zimbabwe were aware of schistosomiasis [13]. Similarly, studies in Brazil and Egypt revealed that people were familiar with schistosomiasis [14].

In our study females appear to have more in-depth knowledge of schistosomiasis than males. Indeed, in these areas' women oversee childcare, which means they are most of the time the ones who bring the children to the hospital when they are sick; Their advance in knowledge about bilharzia could be explained by their close relationship with the health services compared to men. With regards to studies conducted among caregivers in Tanzania, Ng'weng'weta and Tarimo found that married women had significantly higher levels of schistosomiasis-related knowledge compared to unmarried women; this confirms that being responsible for taking care of children increases knowledge about diseases such as schistosomiasis, which mainly affect children[15][16].

Persons in the older age group, 41 years and above displayed more knowledge of the disease than the other; this might be linked to the fact that this is the age group or people who have children and are in contact with healthcare services and Dawa Mobile Health and have been awarded for Schistosomiasis. In Zimbabwe, Mbereko et al. found that the middle age range of 35-65 years had higher proportions of participants who managed to correctly identify the causes of schistosomiasis which is close to our result [17]. That means the only way for them to be awarded is through healthcare. It makes a difference when the sources of information are diversified; for those, there is not a correlation between age group and the level of knowledge like the study of Diabaté AF in Kénieba in Mali, where more respondents have heard from Schistosomiasis at school and from the district's radio[18].

The level of education and the profession

In our findings, a positive relationship was also observed between the level of education and knowledge of schistosomiasis on one hand, and between the profession and the profession on the other. People with tertiary education represent half (48%) of the number of people with high knowledge. Indeed, this appeals to common sense because it is expected that when people attain a higher level of education, they get more exposure and therefore more critical expression of cognitive functions [19].

According to the profession, farmers have better knowledge than pastoralists (24 vs 6%) and unsurprisingly, healthcare workers and teachers demonstrated quite high degrees of knowledge.

Farmers are more exposed than pastoralists in Torrock; during the wet season, this area is flooded, and farmers are more in contact with contaminated water than pastoralists because of their work in the fields; irrigation projects and other water resources development projects have increased transmission of schistosomiasis and other water-related diseases and this has been shown in many studies[20]. As we mentioned above, when the source of information is only the health care services, those who have had the disease are the most informed.

Treatment sought

Among respondents that have ever been infected with schistosomiasis, information about their sources of treatment shows that half of the respondents have used Western medical treatment, approximately one-third resorted to locally generated medicine, while fewer than 5% of respondents used both the Western and local medical intervention at the same time. However, a sizable proportion of the population (10%) have not sought treatment. In Torrock, two types of current attitudes are adopted by patients with a few rare exceptions: preference for therapeutic roots (or leaves, bark) and late (or secondary) recourse to the local health centres[12].

Patients showing the first signs that they attribute to bilharzia tend to treat themselves first with therapeutic roots obtained either through a parent or a healer and passed down from generation to generation. According to collective representations, these roots are more effective than the health centre. As a result, these medicinal plants are more appreciated by the local population not only because they are easily accessible in nature, but also because their secrets are passed down from the ancestors, there is a strong belief in their healing power. Western pills are still perceived as distant, even difficult to access

because of excessive costs. So, the high percentage of using Western pills is due to the failure of traditional treatment.

The main therapeutic plants are known not only by healers but also by patients, adults, and pupils. Hence the existence of a form of democratization and dialogue around the traditional therapeutic knowledge linked to bilharzia so that the patient, him/herself becoming an actor in his recovery, is sometimes able to self-administer the treatment of bilharzia or to advise a patient to use one root rather than another. This constant communication between populations helps to strongly forge the conviction of patients that this disease is effectively curable by the roots. And now, when a former patient relapses, he himself goes to the bush to pick the roots for his treatment[12]. We can conclude that patients have a kind of therapeutic route that starts with traditional medicine and then ends at the health care centre when the symptoms turn into complications.

Schistosomiasis history according to water source (p=0.23)

It appears that in our study there is no relationship between the source of water and the history of schistosomiasis. A total of 142(54%) use the pump wheel which provides clean water; among them, 100(70% of people using clean water) have already had schistosomiasis at least once. This opens the debate on whether more clean water in Torrock could reduce the prevalence of bilharzia. Indeed, many studies in their conclusion recommend access to clean water as the solution for fighting against schistosomiasis[21][22][23].

In our case here, the way of contamination comes more from stagnant water that people walk into during the wet season for some reason than the one they use for household work. Pierre Aubry states five interventions that must be observed for the prevention of Schistosomiasis: health education, access to drinking water, sanitation, the fight against gastropods, and mass chemotherapy.

For Grims and al., while safe water does not contain cercariae, its provision will often not prevent *all* human contact with infested water. In some settings, activities such as fishing, sand harvesting, and car washing account for considerable occupational water contact that safe water supplies would not prevent[24].

In the case of many other water-related diseases, improvements to the water supply focus on preventing the consumption of contaminated water which can be eradicated by providing clean water. However,

since schistosomes infect people by passing through intact skin, the success of water supply improvements in preventing schistosome infection depends on the prevention of water contact[25].

Mobile communications penetration in Torrock

In Torrock, slightly over half (51.5%) of the respondents use mobile telephones. Thus, there is a potential for reaching at least half of the community population with m-health services. Such a population can serve as a strong foundation for establishing health-information programs for prevention and cure and breaking the resilience of this long-standing malaise to public health in Torrock and its environs.

Conclusion

In conclusion, this article sheds light on the complex landscape of schistosomiasis in the endemic region of Torrock, Chad. Despite the availability of treatment and various control strategies, schistosomiasis continues to persist due to factors like limited understanding and awareness among the local population. The study underscores the significance of incorporating cultural and behavioural factors in disease control efforts.

The findings of the research indicate that m-health initiatives not only aid in treatment but also play a vital role in raising awareness about schistosomiasis within the community. This emphasizes the need for a holistic approach that involves sensitizing the population and addressing social attitudes alongside medical treatment. The study's focus on local perceptions and practices highlights the importance of context-specific interventions and the dissemination of accurate information.

By recognizing that disease control involves not only medical intervention but also cultural adaptation and community engagement, the article underscores the potential for successfully combating schistosomiasis and similar diseases in endemic regions. This research contributes to the growing understanding of neglected tropical diseases and emphasizes the value of integrating local knowledge and practices into comprehensive control strategies. Ultimately, community involvement, m-health initiatives, and a broader understanding of the disease's context are crucial components of effective schistosomiasis control efforts.

The results prompt a critical revaluation of the prevailing assumption that enhancing access to clean water alone is a panacea for schistosomiasis control. The study suggests that in the context of Torrock, contamination is more associated with stagnant water encountered during specific activities in the wet season, rather than the water used for household purposes. The findings also validate the hypothesis that

a higher education level correlates with a greater inclination to accept Western medical explanations of schistosomiasis. Despite the initial hypothesis stating that there is no correlation between age and/or gender and the level of knowledge, attitudes, and practices on schistosomiasis, our study reveals noteworthy patterns. Females, particularly those engaged in childcare responsibilities, demonstrated a deeper understanding of schistosomiasis compared to males.

References

1. ^*Mwanga JR, Kinung'hi SM, Mosha J, Angelo T, Maganga J, Campbell CH. (2020). "Village response to mass drug administration for schistosomiasis in Mwanza region, Northwestern Tanzania: Are we missing socioe conomic, cultural, and political dimensions?." American Journal of Tropical Medicine and Hygiene. 103(5):19 69–77.*
2. ^*Mendonça Da Silva I, Thiengo R, Conceição MJ, Rey L, Lenzi HL, Filho P, et al. (2005). "Therapeutic failure of praziquantel in the treatment of Schistosoma haematobium infection in Brazilians returning from Afric a." Mem Inst Oswaldo Cruz. 100.*
3. ^*King CH, Bertsch D. (2015). "Historical Perspective: Snail Control to Prevent Schistosomiasis." PLoS Negl Tr op Dis. 9(4).*
4. ^*Lalaye D, De Jong T. "THE IMPACT OF SINGLE PRAZIQUANTEL ON VISIBLE UROGENITAL LESIONS OF S CHISTOSOMA HAEMATOBIUM WITH ULTRASOUND 7 MONTHS AFTER TREATMENT IN TORROCK.".*
5. a, b, c*Musuva RM, Awiti A, Omedo M, Ogutu M, Secor WE, Montgomery SP, et al. (2014). "Community knowl edge, attitudes and practices on Schistosomiasis in Western Kenya-The SCORE Project." American Journal o f Tropical Medicine and Hygiene. 90(4):646–52.*
6. ^*McManus DP, Dunne DW, Sacko M, Utzinger J, Vennervald BJ, Zhou XN. (2018). "Schistosomiasis." Nat Rev Dis Primers. 4(1).*
7. ^*Oyibo EU, Khalid A, Muhammad AS, Agwu NP, Oyibo EU. "Genitourinary Complications of Schistosomiasi s." International Journal of Medical Science and Dental Research. https://www.ijmsdr.org.*
8. ^*Colley DG, Bustinduy AL, Secor WE, King CH. (2014). "Human schistosomiasis." The Lancet. 2253–64.*
9. ^*Muller R. (1995). "Human schistosomiasis. Edited by P. Jordan, G. Webbe, and R.F. Sturrock. (Wallingford, O xon, CAB INTERNATIONAL1993). 465 pp. £65.00 (US$ 123.50). ISBN 0 85198 844 X." J Helminthol. 69(1).*
10. a, b, c*Helena. (2009). "Prévalence et enquête sur les connaissances, attitudes et pratiques de la population de Koyom (MAYO-KEBBI EST) concernant la schistosomose urinaire.". N'Djamena: Faculté des Science de la S*

anté.

11. ^ *Onyeneho NG, Yinkore P, Egwuage J, Emukah E. (2010). "Perceptions, attitudes and practices on schistoso miasis in Delta State, Nigeria." Tanzania Journal of Health Research. 12.*
12. a, b, c *Abdelbanat O, De Bruin M. (2018). "ANALYSE DE L'USAGE DES TECHNOLOGIES DE L'INFORMATION E T DE LA COMMUNICATION (TIC) DANS LA SANTE A TORROCK (TCHAD)." [Thesis]. Université de N'Djamé na. https://www.voice4thought.org/wp-content/uploads/2024/03/memoire-oumar-FIN-2.pdf.*
13. ^ *Ndamba J, Makura O, Gwatirisa PR, Makaza N, Kaondera KC. (1998). "A cost-effective two-step rapid diagn osis of urinary schistosomiasis in Zimbabwe." Central African Journal of Medicine. 44(7).*
14. ^ *Uchoa E, Barreto SM, Firmo JOA, Guerra HL, Pimenta FG, Lima E Costa MFF. (2000). "The control of schist osomiasis in Brazil: An ethno-epidemiological study of the effectiveness of a community mobilization prog ram for health education." Soc Sci Med. 51(10).*
15. ^ *Ng'weng'weta SB, Tarimo DS. (2017). "Urinary schistosomiasis among preschool-age children in an ende mic area of Kinondoni municipality, Dar es Salaam, Tanzania 2016." Asian Pac J Trop Dis. 7(3).*
16. ^ *Kibira SPS, Ssempebwa JC, Ssenyonga R, Radloff S, Makumbi FE. (2019). "Schistosomiasis infection in pre-s chool aged children in Uganda: A qualitative descriptive study to identify routes of exposure." BMC Infect Di s. 19(1).*
17. ^ *Mbereko A, Chimbari MJ, Manyangadze T, Mukaratirwa S. (2020). "Knowledge and perceptions of schisto somiasis, a water-borne disease, in two semi-arid rural areas of South Africa (Ndumo) and Zimbabwe (Ntal ale)." Food Waterborne Parasitol. 21.*
18. ^ *Diabaté AF, Doumbia S. (2019). "Connaissances, attitudes et pratiques des enfants d'âge scolaire et des adu ltes face aux schistosomiases dans le district sanitaire de Kéniéba, Mali." [Thesis]. Faculté de Médecine et d'Odontostomatologie (FMOS). https://www.bibliosante.ml/bitstream/handle/123456789/3810/19M369.pdf;j sessionid=1F8754EC89FA709E7019C89C65E0E62F?sequence=1.*
19. ^ *Nenzhelele F, Anyanwu FC, Ramoteme M, Mabunda J, Henry A, Kwabena K. (2020). "A quantitative assess ment of the level of knowledge, attitude, and practices of farmworkers regarding schistosomiasis in a rural community in South Africa." Afr J Prim Health Care Fam Med. 12(1).*
20. ^ *Boelee E, Madsen H. (2006). "Irrigation and schistosomiasis in Africa: ecological aspects.". International W ater Management Institute.*
21. ^ *Grimes JE, Croll D, Harrison WE, Utzinger J, Freeman MC, Templeton MR. (2015). "The roles of water, sanit ation, and hygiene in reducing schistosomiasis: A review." Parasites and Vectors. 8.*

22. ^Grimes JET, Croll D, Harrison WE, Utzinger J, Freeman MC, Templeton MR. (2014). "The Relationship between Water, Sanitation and Schistosomiasis: A Systematic Review and Meta-analysis." PLoS Negl Trop Dis. 8(12).

23. ^Secor WE. (2014). "Water-based interventions for schistosomiasis control." Pathog Glob Health. 108(5).

24. ^De Moira AP, Fulford AJC, Kabatereine NB, Kazibwe F, Ouma JH, Dunne DW, et al. (2007). "Microgeographical and tribal variations in water contact and Schistosoma mansoni exposure within a Ugandan fishing community." Tropical Medicine and International Health. 12(6).

25. ^Mara DD, Feachem RGA. (1999). "Water- and Excreta-Related Diseases: Unitary Environmental Classification." Journal of Environmental Engineering. 125(4).

Declarations

Funding: No specific funding was received for this work.

Potential competing interests: No potential competing interests to declare.