Attitudes, knowledge and practices in Schistosomiasis among the population of the Health Zone of Katana, South Kivu, Eastern Democratic Republic of Congo

Bakulikira M[1*], Bayubasire C[1] , Bagalwa M[2], Baluku B[2], Mulumeoderhwa K.[3]

[1]*Centre de Recherche en Sciences Naturelles de Lwiro, Département de l'Environnement, Laboratoire de Gestion Intégrée des Ressources en Eau, République Démocratique du Congo.*

[2]*Centre de Recherche en Sciences Naturelles de Lwiro, Département de Biologie, Laboratoire de Malacologie, République Démocratique du Congo.*

[3]*Centre de Recherche en Sciences Naturelles de Lwiro, Département de Nutrition, Laboratoire de Statistique et Informatique, République Démocratique du Congo.*

*Corresponding author: jpbakulikira73@gmail.com

ABSTRACT

Schistosomiasis or bilharziasis is a parasitic disease caused by trematodes of the genus Schistosoma, five of which are pathogenic to humans in tropical regions and the Democratic Republic of Congo is not excluded. A survey was carried out on 346 people in the Katana Health Zone in the period June to September 2015 to assess the population's knowledge, attitudes and practices with regard to intestinal schistosomiasis *Schistosoma mansoni*. A questionnaire was administered to the population of the Katana region in the Katana Health Zone. The results of the survey show that the population of the Katana Health Zone has a relatively low level of education; despite being aware of the disease, it is unaware of the mode of transmission, its vector and the means of control. The population perceives the disease as poisoning, especially with regard to its complicated form ($p = 0.000$). This lack of knowledge led to the endemicity of schistosomiasis with high morbimortality in the Katana Health Zone ($\chi2 = 46.1646$, $p = 0.0008$). Two therapeutic approaches are used by the population: traditional treatment and medical treatment. Schistosomiasis is a public health problem in the Katana Health Zone and need a special attention by health facilities and supervision by training of community relays that will pass on this training to all the population in risk.

Key words: Knowledge, attitude and practices; schistosomiasis; Health of Katana, Southern-Kivu province, East of DRC.

INTRODUCTION

Schistosomiasis is a chronic endemic disease with slow progress, low mortality, high morbidity and severe complications (portal hypertension, recurrent genitourinary infections, infertility, glomerulonephritis, renal insufficiency often leading to severe physical, social and economic disabilities) (WHO, 2004). This is combined with other helminthes, can seriously endangered the productive potential of developing countries (Moné et al., 2010, WHO, 2012). It is a parasitic disease endemic in tropical regions. It is one of the most prevalent diseases in the world and occurs in about 76 countries in Africa, South America, the Middle East and the South of Asia

(WHO, 2011). About 600 million of peoples are exposed to the disease which more than 200 million are infested and nearly 280 million die each year from complications (Chippaux 2000, Engelsa et al., 2002, WHO, 2011, Gryseels et al., 2006). Because of its prevalence, it ranks first among water-borne diseases and second only to malaria in Africa, hence its importance in public health in the tropics and subtropics (WHO, 2011, Engelsa et al., 2002, Diarra, 2002).

In the Democratic Republic of Congo, schistosomiasis is a major public health problem, neglected by the population and health institutions. Schistosomiasis is severe and its consequences are reversible as well as irreversible. Studies in some outlying areas have shown that schistosomiasis is a real scourge in the country (Baluku et al., 2000, Balemirwe et al., 2016, Linsuke et al., 2014). In some parts of the country, the rate of schistosomiasis varies from 5 to 89% of cases (Ndegeyi et al., 2014, Baluku et al., 2000). This parasite is linked to water and poor sanitation conditions mainly in tropical and subtropical countries where hydro-agricultural development creates a favorable context for the development of snail's intermediate host of the disease, making possible the infestation of the population that comes to use these waters (Ndegeyi et al., 2014). This area of Katana, where the Katana Health Zone is located, contains several aquatic systems including rivers, streams, swamps, fish ponds and Lake Kivu (Bagalwa et al., 2015; Balemirwe et al., 2016). Cultural attitudes, practices and socio-economic activities of the population must be taken into account to understand how this parasite is changing at the community level. It is also important to know how people in a community perceive the disease. This will help to establish knowledge of infection, pathogen, means of transmission, treatment, control and prevention by the community. Thus, the present study aims to obtain data on the knowledge, attitudes and daily practices of the population regarding schistosomiasis in order to determine the strategies for controlling this disease and controlling its morbidity. To our knowledge, these data on this parasite are still non-existent in the Health Zone of Katana. In this study we formulate the hypothesis that the population of the Health Zone of Katana does not know this disease that is why the infestation is high.

MATERIAL AND METHODS

Description of the Katana Health Zone and selection of the study population Katana Health Zone is located in the province of South Kivu, Democratic Republic of Congo. It contains 17 health areas from health located near Lake Kivu (1460 m) at low altitude to the high altitude near the Kahuzi Biega National Park (1900 m). These health areas are: Ciranga, Kabushwa, Katana/Nuru, Mugeri, Ihimbi, Mabingu, Kabamba, Kadjucu, Iko, Luhihi, Mushweshwe, Birava, Irambira, Cishugi, Ishungu, Lugendo, Ibindja (Figure 1).

Fig.1. Map of the Katana Health Zone.

The Health Zone of Katana has 17 health areas, 9 were randomly selected for this study with an estimated population of 97,617.

Survey by questionnaire

A questionnaire has been developed containing questions relating to schistosomiasis. It has been tested, improved and submitted to the target population. Probabilistic sampling of the systematic random type combined with the accidental sample guided the choice of our respondents. All persons fulfilling the inclusion criteria were systematically taken into account in the study during the survey. For this study, population consisted of adults from 18 to over 60 years old living in the village for at least three years was include in this study. For sampling size, the lunch formula was used. Thus, a sample of 346 respondents (women and men) was formed.

Data analysis

The ACCESS database was used for data encoding and Epi-Info and SPSS software were used for statistical data analysis. The analysis of some questions by association using the Chi-square test in Epi-Info gave the results in the tables.

RESULTS

Characteristics of the surveyed population

The characteristics of the surveyed population in this study is presented in the table 1.

Table 1. Main characteristics of the surveyed population

Survey elements	Characteristics	Number	%
Gender	Male	165	47.7
	Female	181	52.3
Level of formation	Primary	59	17.1
	Orientation cycle	29	8.4
	Secondary school without diploma	18	5.2
	Diploma	25	7.2
	University	13	3.8
	Without study	202	58.4
Age bracket	18-40 years	163	47.1
	41-60 years	139	40.2
	> 60 years	44	12.7
Principals activities	Agriculture	219	63.3
	Fishing	36	10.4
	Small business	64	18.5
	Teacher	15	4.3
	Livestock	12	3.5
Others activities	State employee	103	29.8
	Faking job	78	22.5
	Job less	165	47.7

For the 346 respondents to our survey, 47.7% were male and 52.3% were female. Most of these respondents were uneducated (58.4%) while those with a university education level were less (3.8%). Respondents aged between 18-40 years were more numerous in our survey (47.1%) than those over 60 (12.7%). The main activity of the respondents was agriculture (55.5%) as indicated.

Attitudes, knowledge and practices of the population surveyed against schistosomiasis

Results of the attitudes, knowledge and practices of population against schistosomiasis are presented in Table 2.

Table 2. Knowledge, attitude and practices in the face of the disease

Variable		Effectif	%
Knowledge of the existence of bilharziasis	Knowledge	196	56.6
	Do not know	150	43.4
Source of knowledge of the existance of	Parent	55	15.9

schistosomiasis	Radio	35	10.1
	Television	5	1.4
	Community relay	32	9.2
	School	19	5.5
	Friends	90	26
	Ne connait rien	110	31.8
Knowledge of signs	Bloody diarrhea	32	9.2
	Macoscopic haematuria	31	9
	Persitent abdominal pain	105	30.3
	Abdominal bloating with ascites	57	16.5
	Cutaneaous pruritus	34	9.8
	Do not know	87	25.1
History of the disease in households	Antecedent	120	34.7
	No antecedent	226	65.3
Therapeutic route	CentreHealth Center	162	46.8
	Purchase drugs at the private pharmacy	105	30.3
	Traditional medecins	79	22.8
Peoples in risks	Children of school age	61	17.6
	Adolescents	37	10.7
	Fisherman	64	18.5
	Men	55	15.9
	Women	35	10.1
	Old men	4	1.2
	Every one	90	26
Mode of transmission	Drink unsafe water	90	26
	Eat dirty food	47	13.6
	Play and/or swim in the rivers, lakes or ponds	105	30.3
	Do not know	104	30.1
Perceived of the disease in households	Death	34	25,6
	No deaths	96	74,4
Perception de la maladie dans les ménages.	Poisoning	133	38,4
	Instestinal worms	84	24,3
	Bilharzia	60	17,3
	Do not know	69	19,9

Knowledge of intermediate hosts	Known	31	11,7
	Do not know	235	88,3
Knowledge of hosts hazard	Transmits disease	18	58,1
	Saline water	7	22,6
	Do not know	6	19,4
Knowledge of ways to control the disease	Drinking clean water	89	37,7
	Wearing shoes	12	5,1
	Take the medecation	10	4,2
	Pray	25	10,6
	No means used	100	42,4

It shows that 68.2% of the respondents to the questionnaire know the existence of intestinal schistosomiasis, 38.1% know it thanks to the friends and 23.3% by the parents who told them about this disease. As for knowledge of the signs of this disease, 34.3% evoke persistent abdominal pain while 18.6% say it is bloody diarrhea, 62.5% do not know a history of this disease in their households. In case of suspicious symptom, the population goes to the health center (47.7%) or buys drugs in private pharmacies (26.9%) or uses traditional medicine (25.4%). Respondents (47.0%) know that everyone is predisposed to catch this disease, but mainly women (14.8%), fisherman (14.4%) and children at school-aged (11.9%). As for respondents' knowledge of the mode of transmission, 30.3% know that bathing in rivers and other aquatic systems is the cause of schistosomiasis transmission and 69.6% do not know how this disease is transmitted to the man. Results about the case of death due to schistosomiasis in the households show that 74.4% doesn't know the cases of death whereas only 25.6% know cases of death due to this disease in the population. Among the respondents, 38.4% have a perception that this disease is due to poison, 24.3% think that these are the intestinal worms, 19.9% have no perception of the disease and only 17, 3% know intestinal schistosomiasis.

The results on respondents' knowledge of the existence of the intermediate host of schistosomiasis show that 76.9% doesn't know and 23.1% know the snails. In addition, only 11.7% know about the dangers of snails in the transmission of the disease, while 88.3% doesn't know. Among respondents, 42.4% doesn't know how to control the transmission of this disease, 37.7% think that drinking clean water can prevent transmission, 10.6% think that prayer is a solution, 5.1% think that wearing shoes can be a solution and only 4.2% say that taking the drugs can prevent the disease.

Association of investigation questions

Statics Analyses of association survey questions in the study are presenting the results between the existence of a history of schistosomiasis and death in the population of Health Zone of Katana in South Kivu, Democratic Republic of Congo (Table 3).

Table 3: Association between the antecedent of schistosomiasis and death in the community.

Antecedent	Deceased	**Not** Deceased	**OR**	**IC**	**p**	**Test**
Antecedent	40	96	1,83	1,05-3,16	0,040	S

Not antecedent	40	170				

OR = odds ratio, IC = confidence interval, p = probability, S = significant test, NS = not significant test.

The results in this table show that there is a significant difference (S) between contracting the disease in the past and death (p = 0.040 <0.05).

Table 4 presents the results of the association between the existence of a history of schistosomiasis and the gender of the respondents (Table 4).

Table 4: Association between the antecedents of schistosomiasis and the genus of the respondent

Antecedent	Male	Female	OR	IC	p	Test
Antecedent	71	58	1,60	1,03-2,48	0,045	S
No Antecedent	94	123				

OR = odds ratio, IC = confidence interval, p = probability, S = significant test, NS = not significant test.

The results in this table show that there is a significant difference (S) between contamination of the disease in the past and the respondent's gender (p = 0.045 <0.05).

Table 5 presents the results of the association between the respondent's educational level and the control methods used against bilharzia (Table 5).

Table 5: Association between the level of study and the means of fight against the disease.

Level of study	Correct mean of control	Wrong means of control	OR	IC	p	Test
Diploma	103	166	4,63	2,94-7,29	0,000	S
No diploma	243	180				

OR = odds ratio, IC = confidence interval, p = probability, S = significant test, NS = not significant test.

In view of this table, there is a very significant difference between the level of study of the respondents and the means of control used against the disease (p = 0.000 <0.05). That means, the higher the level of study, the more the correct means of struggle are used.

The association between respondents' level of education and their perception of schistosomiasis is presented in Table 6 (Table 6).

Table 6: Association between level of education and perception of illness in the community.

Level of education	Good perception	Bad perception	OR	IC	p	Test
Diploma	41	144	3,69	2,54-5,56	0,000	S
No diploma	305	202				

OR = odds ratio, IC = confidence interval, p = probability, S = significant test, NS = nonsignificant test

The results in this table show that there is a very significant difference (S) between respondents' level of education and their perception of the disease (p = 0.000 <0.05). On the other hand, there is a very significant difference (S) in the association between the respondent's main activity and the knowledge of the danger represented by the disease (p = 0.000 <0.05) (Table 7).

Table 7: Association between the main activity carried out and the knowledge of the danger represented by the disease.

Main activity	Knowledge of the risk	No knowledge of the risk	OR	IC	p	Test
Predisposing activity	222	285	0,29	0,18-0,46	0,000	S
Activity that does not predispose	124	61				

OR = odds ratio, IC = confidence interval, p = probability, S = significant test, NS = not significant test.

The association between the therapeutic route and the knowledge of the danger of the disease is presented in Table 8 (Table 8).

Table 8. Association between therapeutic route and knowledge of the danger

Therapeutic route	Knowledge of the risk	No knowledge of the risk	OR	IC	P	Test
Health Center / Hospital	167	130	0,12	0,05-0,28	0,000	S
Self-medication	179	216				

OR = odds ratio, IC = confidence interval, p = probability, S = significant test, NS = not significant test.

The results of the table reveal a very significant difference (S) between the patient's therapeutic itinerary and the knowledge of the danger represented by the disease (p = 0.000<0.05). A very significant difference (S) was obtained between knowledge of the existence of bilharzia and the danger it represents for the population (p = 0.0000 <0.05) in view of the results presented in Table 9 (Table 9).

Table 9. Association between the knowledge of the existence of bilharziasis and the danger it represents.

Bilharziasis	Knowledge of the risk	No knowledge of the risk	OR	IC	p	Test
Exist	115	71	0,34	0,21-0,54	0,000	S
Does not exist	231	275				

OR = odds ratio, IC = confidence interval, p = probability, S = significant test, NS = not significant

DISCUSSION

According to the knowledge of the population about the disease, the majority of the population of the Health Zone of Katana knows this pathology and the main sources of information on this disease are the friends, the parents and not the Health Centers via the relays Community. The community relays chosen in the community scarcely sensitize the population about this disease. These results are consistent with those found in Bamako in peri-urban areas (Landoure, 2006). Among the respondents in our survey, some have a perception that poison is the cause of a serious form of this disease. Persistent abdominal pain and bloody diarrhea are the symptoms of the digestive form (*Schistosoma mansoni*) most cited by respondents as also found in other studies (Musava et al., 2014). Cutaneous pruritus was not a conclusive sign of the disease. Among our respondents were victims of schistosomiasis or one of their relatives and stated that they consulted health facilities for diagnosis and appropriate treatment. Others have resorted to traditional medicine to be cared for by indigenous products which, unfortunately with a probability of therapeutic failure and death. This has also been observed in Bamako (Landoure et al., 2006) and in Uganda (Kabatereine et al., 2014) where people who have hunted treatment by traditional practitioners have experienced serious complications of the disease. Regarding the vulnerability of the disease, respondents shown that everyone is predisposed to the pathology but especially fishermen, women and children of school age. This may be explained by their exaggerated frequency in aquatic systems carrying vectors of the disease, contrary to what was found in a study in Nigeria where school-age boys were cited as being the most at risk (Macdonald, 2006). Knowledge about the mode of transmission of schistosomiasis, prevention and the intermediate host remain unknown by the population of the Katana Health Zone, this was found on nearly ¾ of respondents. According to Odoka et al., (2014) the explanation is to be found in the behavior of the populations for the use of water as dumps and even place of defecation. Dembele, (2010) also found a relationship between the prevalence of the disease and factors influencing transmission such as defecation in streams or around aquatic systems, swimming in waters containing infested snails. Knowledge about the symptoms of schistosomiasis, the majority of respondents had ideas about some signs like bloody diarrhea, abdominal pain but she was not able to dissociate them with other intestinal disorders. Its results coincide with those of Uchoa et al., (2000) in Brazil, which show that the Brazilian population was unable to differentiate the symptoms of schistosomiasis and other helminthiases.

Respondents are ignorant of the mode of transmission and the means of controlling the disease. Some people think that the disease is transmitted by drinking unsafe water and others think that it is transmitted by dirty hands. Indeed, contamination of this disease is due to a long time in water containing furcocercariae from the intermediate host of bilharzia (WHO, 2012). According to a survey conducted in Mauritania among schoolchildren aged 10-16 and with high school students and professional students from the rural commune of Baguine in Mali, students could not make the connection between direct contact and contaminated water and schistosomiasis. These students also think that the disease is contracted by drinking unsanitary water as for the population of the Katana Health Zone (Landoure et al., 2006, Ahmedou, 2013). But also, in some studies, some forms of schistosomiasis such as Schistosoma bovis and some fasciolosis with *Fasciola hepatica* have been found to be transmitted via unprepared foods were cercaria was attached (Incani et al., 2002). Messaoudene, 2012, Balemirwe et al., 2016).

In fact, the lack of knowledge and the defective practices are factors that could explain the rapid reinfection of the high rate of schistosomiasis in the Katana Health Zone, as is the case in the Office of Niger Zone (Landoure et al., 2006). These same results are similar to those obtained by Yapi in Ivory Coast in 1988.

Conclusion

At the end of this study, which involved 346 people aged between 18-60 years in the Katana Health Zone; around ¾ respondents are aware of schistosomiasis. The source of information of people about the disease was parental and friendly. The media source is less

used by the population due to poverty and the relatively low level of education. Two therapeutic methods are used by the population of the Health Zone of Katana in case of bilharziasis including: traditional treatment and medical treatment. The population of the Katana Health Zone perceives the disease and especially the complicated cases as poisoning.

On the other hand, the lack of knowledge of the mode of transmission of schistosomiasis, the intermediate host, the resort to traditional medicine and a defective perception of the disease are at the origin of the endemicity of schistosomiasis and constitute an obstacle to its elimination in the Katana region. The training of community relays on this disease, with a view to sensitizing the population on the use of running water to control schistosomiasis, would be essential in the Katana Rural Health Zone. A study of the mode of infection and the prevalence of schistosomiasis would also be important in public health.

ACKNOWLEDGEMENTS

Conflict of interest:

The authors state that there are no competitions of interest in this work.

Contributions of the authors

Bagalwa and Baluku designed the study, followed the field investigations and drafted the final manuscript. Bakulikira administered the survey questionnaires to the population and analyzed the data with the support of Bayubasire and Mulumeoderhwa analyzed the data statistically.

REFERENCES

Ahmedou M. 2013. Les bilharzioses dans le Moughata de Keur-Macere : Connaissance, attitude et pratiques face à la bilharziose auprès des élèves de huit villages de la Mauritanie en octobre 2012. Thèse de Maitrise, Université de l'Andalousie, 51p.

Bagalwa M, Majaliwa JGM., Bashwira M, Tenywa M, Karume K. 2015. Sediment and nutriment loads into rivers, in the lac Kivu basin, Democratic Republic of Congo. *Int. J.Biol. Chem. Sci.*, 9, 3, 1679-1690. DOI : http://dx.doi.org/10.4314/ijbcs.v9i3.46

Balemirwe F.A, Bagalwa M., Batumike C., Munganga C.,Bakulikira M., 2016. Distribution de *Lymnaea natalensis* (Mollusca : Pulmonata) mollusque hôte intermédiaire de la *Fasciolose hepatica* dans la région de Katana. *Afrique Science*, 12, 1, 16-26.

Baluku B., Bagalwa M., Bisimwa B. 2000. Enquête parasitologique sur la shistosomose à *Schistosoma mansoni* à Katana, République Démocratique du Congo. *Médecine Tropicale,* 60, 163 – 166.

Chippaux JP, 2000. Control of Schistosomiasis: reality and futurology. *Médecine Tropicale*, 60: 54-55.

Dembele M I. 2010. Connaissance, attitudes et pratiques face à la schistosomiase auprès de lycéens et élèves professionnels de la commune rurale de Buguinedi Camp (Mali).

Diarra Z. 2002. Etude clinique parasitologique et épidémiologique de la bilharziose à Malodo. Thèse de médecine, Bamako. 95p.

Engels D, Chtsulo L, Montrisor A, Savioli L, 2002. The global epidemiolocal situation of Schistosomisis and mew approaches to control and reseach. *Acta Tropica*, 82, 139- 146.

Engelsa D, Chitsulob L, Montresora A, Savioli L, 2002. The Global Epidemiological Situation of Schistosomiasis and New Approaches to Control and Research. *Acta Trop.* ,82, 2, 139–146.

Gryseels B, Polman K, Clerinx J, Kestens L, 2006. Human schistosomiasis. *Lancet*, 368, 1106–1118.

Incani RN, Vieira M, Pacheco S, Planchart, Amarista M, Lazdins J. 2002. Human infection by *Fasciola hepatica* in Venezuela: report of a geriatric case. *Invest clin.*, 44, 255-260.

Kabatereine N, Fleming F, Thou W, Tinkitina B, Tukahebwa EM, Fenwick A. 2014. Community perception, attitudes, practices and treatement seeking behaviour for Schistosomiasis, in L. Victoria islands in Uganda. *BMC Res Notes*; 900.doi: 10.1186/1756-0500-7-900.

Landoure A, Traore MS, Sacko M, Coulibaly G, 2006. Connaissance attitude et pratique de la population face à la schistosomiase à l`office du Niger. *Mali Medical*, 21, 1, 30 – 38.

Linsuke S, Nundu S, Mupoyi S, Mukele R, Mukunda F, Kabongo M M, da Luz M I, Van Geertruyden JP, Van Sprundel M, Boelaert M, Polman K, Lutumba P, 2014. High Prevalence of Schistosoma mansoni in Six Health Areas of – Kasansa Health Zone, Democratic Republic of the Congo: Short Report. PLoS Negl Trop Dis 8(12): e3387. doi:10.1371/journal.pntd.0003387

Macdonald G. 2006. The dynamics of helminth infection with special reference to schistosoma. *Trans. R. Soc. Trop. Med. Hyg.*, 81, 202-209.

Messaoudene S. 2012. Etude biochimique de souches locales de *Fasciola hepatica* (Linné, 1758) parasite responsable de la distomatose hépatobiliaire chez l'homme et ruminants. Thèse de Maitrise en Parasitologie, Université d'Oran Es-Senia, 98p.

Moné H, Ibikonné M, Massougbodji A, Mouahid G, 2010. Human Schistomiasis in Economic Community of West African States (ECOWAS): epidemiology and control. *Advences in parasitology*, 71, 33-91.

Musava RM, Awiti A, Omedo M, Ogutu M, Secor WE, Montgomery SP. 2014. Community knowledge, attitude and practices on Schistosomiasis in Western Kenya. The SCORE Project. *Am J Trop. Hyg*, 90, 646 - 652.

Ndegeyi KB., Bagalwa M.J.J., Baluku B.J.P., Bahizire K.J.L., Batumike C.H.,   Bayongwa C.J., 2014. Evolution de la Prévalence de la Schistosomiase à *Schistosoma mansoni* et *Schistosoma haematobium* dans la Zone de Santé de Katana. *International Journal of Innovation and Applied Studies,* 7, 1, 186-197.

Odoka SO, Anyona DN, Abuom PO, Dida GO, Karanja D, Vulule JM. 2014. Community perception of Schistosomiasis transmission, prevalence and control in relation to aquatic habitats in the Lake Victoria bassin of Kenya East. *Afr. Med. J.*, 91, 232- 244.

OMS 2004. Schistosomiases et géohelminthiase: prévention et lutte, Rapport d'un comité d'Experts ; Série de rapports techniques, Genève ; 912.

OMS, 2012. Schistosomiase (Bilharsiose). Organisation Mondiale de la Santé, Genève, Aide-mémoire, n°115.

Uchoa E, Barreto SM, Firmo JO, Guerra HL, Pimanta Jr FG, Costa MF. 2000. The control of Schistosomiasis in Brezil: an ethno-épidemiological study of the effectiveness of a community mobilization program for health education. *Soc. Sci Med.*, 51, 1529-1541.

WHO, 2011. Rapport du comité OMS d'experts sur la lutte contre les maladies tropicales négligées.

Yapi Y, Rey L, N'Goran KE, Bellec C, Curin P, 1988. Enquête parasitologique sur la schistosomiase à Yamoussoukro (Côte-D'ivoire). *Médecine d'Afrique noire*, 35, 1, 59-65.