

Full Length Research Paper

Evaluation of knowledges and experiences of female genital schistosomiasis among healthcare workers in gynecology services in Abidjan, Côte d'Ivoire

Kpongbo Etienne Angora^{1,2*}, Henriette Abo Vanga-Bosson¹, Pulchérie Christiane Kiki-Barro¹, Estelle Massafoma Koné¹, Sébastien Assouhoun Miezan¹, Doriane Kouamé¹, Valérie Akoua Bédia-Tanoh¹, Fulgence Kondo Kassi¹, Abibatou Konaté-Touré¹, Vincent Djohan¹, William Yavo¹ and Hervé Eby Menan¹

¹Pharmaceutical and Biological Sciences Training Research Unit, Parasitology and Mycology Department, University of Félix Houphouët Boigny, BPV 34 Abidjan, Côte d'Ivoire.

²Medical Biology Service, University Hospital of Angré, BP 54378 Abidjan, Côte d'Ivoire.

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Female genital schistosomiasis (FGS), a serious clinical form of urinary schistosomiasis, is widespread in sub-Saharan Africa but little-known in Côte d'Ivoire. The objective of this study was to assess practitioners' knowledge and experience of FGS in Abidjan. Data were collected using a questionnaire from March to October 2024 in healthcare centers in Abidjan among 281 healthcare workers in gynecology and obstetrics services. Only 57% of respondents identified *Schistosoma haematobium* as the causative agent, and the mode of transcutaneous contamination was known by very few (0.46%). Infertility and the risk of HIV infection were recognized as consequences of the disease by 20.1% and 9.6% of respondents, respectively. The pelvic examination to confirm FGS was known by only 11% of practitioners. For treatment, 66.7% of practitioners were aware of praziquantel. However, mass drug administration with praziquantel as a prevention method was not well-known (4.55%). Regarding experience with FGS, only 5% of respondents had ever suspected or experienced cases in their facility, and in 50% of these cases, the specific treatment used was praziquantel. This study highlights that FGS is not well-known by practitioners, and health professionals' lack of information about the disease can lead to poor treatment. Implementing training and awareness-raising programs for healthcare personnel will help prevent consequences for women in areas at risk of urinary schistosomiasis.

Key words: Female genital schistosomiasis, healthcare workers, knowledge, experience, Côte d'Ivoire.

INTRODUCTION

Human schistosomiasis is a chronic neglected tropical disease that affects approximately 220 million people

worldwide (Colley et al., 2014). This parasitic disease is widespread in sub-Saharan Africa, accounting for over

*Corresponding author. E-mail: angora.etienne1@ufhb.edu.ci.

80% of the global disease burden (Ndubani et al., 2024). Schistosomiasis, caused by a trematode parasite of the genus *Schistosoma*, is a major public health problem that affects the social and economic development of tropical regions, particularly in sub-Saharan Africa (World Bank, 2013). Female genital schistosomiasis (FGS), a primary consequence of urinary schistosomiasis, is caused by the trematode *Schistosoma haematobium* (Colley et al., 2014). The deposition of the parasite's eggs in urogenital tissue induces inflammatory and pro-inflammatory responses that can lead to calcification and adverse effects, such as the formation of granulomas typically in the bladder wall (Costain et al., 2018; Norseth et al., 2014). The disease can progress to a genital form with devastating consequences on the reproductive and mental health of affected women.

In both men and women, *S. haematobium* affects the urinary and genital tracts (Ross et al., 2002). In women and girls, this parasite causes gynecological disease known as female genital schistosomiasis (Hotez et al., 2021; Kjetland et al., 2014). Chronic *S. haematobium* infection in females can lead to FGS, which is responsible for ectopic pregnancy, infertility, cervical lesions, and social stigmatization (Hotez et al., 2019). The diverse clinical lesions of FGS are risk factors for sexually transmitted diseases, including HIV (Hotez et al., 2020; Patel et al., 2021).

Female genital schistosomiasis often remains undetected, as diagnosis is based on visual inspection of lesions, such as blisters, microcysts, micro-nodules, warts, and inflammatory plaques on the cervix and vaginal wall, visualized by colposcopy (Yegorov et al., 2018). At this stage, schistosome eggs are no longer released into the urine, making them impossible to detect by microscopy (Utzinger et al., 2015). Colposcopy is an advanced gynecological examination that requires an experienced investigator and is rarely available at peripheral health centers. Its use has been debated for decades in developing countries, due to problems of standardization and variability in performance (Xue et al., 2020). Colposcopy is also an essential clinical diagnostic tool for the prevention and management of cervical cancer, which can also be caused by FGS (Valls et al., 2023).

Little is known about practitioners' knowledge of female genital schistosomiasis, particularly in Côte d'Ivoire. The lack of data on this disease and the risks of misdiagnosis and ineffective treatment can lead to flaws in the healthcare system, resulting in erroneous treatment for women suffering from this condition. This study aims to understand healthcare workers' knowledge and experiences regarding female genital schistosomiasis, providing essential information for designing effective interventions to promote correct care-seeking and management of the disease. To our knowledge, this is the first study describing female genital schistosomiasis

in Côte d'Ivoire.

MATERIALS AND METHODS

Study setting

The study took place in Abidjan, southern Côte d'Ivoire, and was conducted in seven healthcare centers: University Hospitals of Angré, Cocody, and Treichville; General Hospitals of Bingerville, Koumassi, and Port-Bouët; and the Military Hospital of Adjamé. Abidjan is characterized by the Ebrié Lagoon, which runs through the city and greatly influences its urban layout. The city has a tropical climate, marked by two rainy seasons and two dry seasons, with high temperatures throughout the year, averaging between 25 and 32°C. Humidity is also high, particularly during rainy periods. The city's vegetation consists of a few remaining trees, having transitioned from a forest environment to a more developed urban landscape with gardens, parks, and lined trees along roads. Some green spaces still exist, such as the Banco National Park, a large protected primary forest near the city (ONU, 2023). Figure 1 illustrates the study areas.

Study design and population

This cross-sectional study was conducted from March to October 2024 in healthcare centers in Abidjan among healthcare workers in gynecology and obstetrics services. Healthcare workers who had daily contact with women and provided consent were included in the survey, specifically gynecologists, nurses, midwives, interns, and medical students working in gynecology services.

Data collection and procedure

Data collection involved a pre-tested questionnaire comprising 32 single-choice, true/false, and multiple-choice questions. The questionnaire was adjusted based on the pre-test results and subdivided into three main sections: socio-demographic characteristics (Questions 1-5), general questions concerning female genital schistosomiasis (Questions 6-22), and respondents' experience with therapeutic management and prevention of the condition (Questions 23-32). Before starting the survey, authorization requests were sent to the various health facilities to obtain the agreement of those in charge. Some facilities failed to respond despite reminders and were excluded from the survey. Data were collected through a questionnaire distributed to each healthcare worker who agreed to participate in the study.

Statistical analysis

The data were entered into a Google Forms form and imported to Microsoft Excel version 2016. Data analysis was performed using STATA 14.2 software. Univariate analysis was conducted using the Chi-square test and Fisher's exact test to compare groups. Associations and discrepancies with a p-value of less than 0.05 were considered statistically significant.

RESULTS

Sociodemographic characteristic of population

A total of 281 practitioners participated in the study,

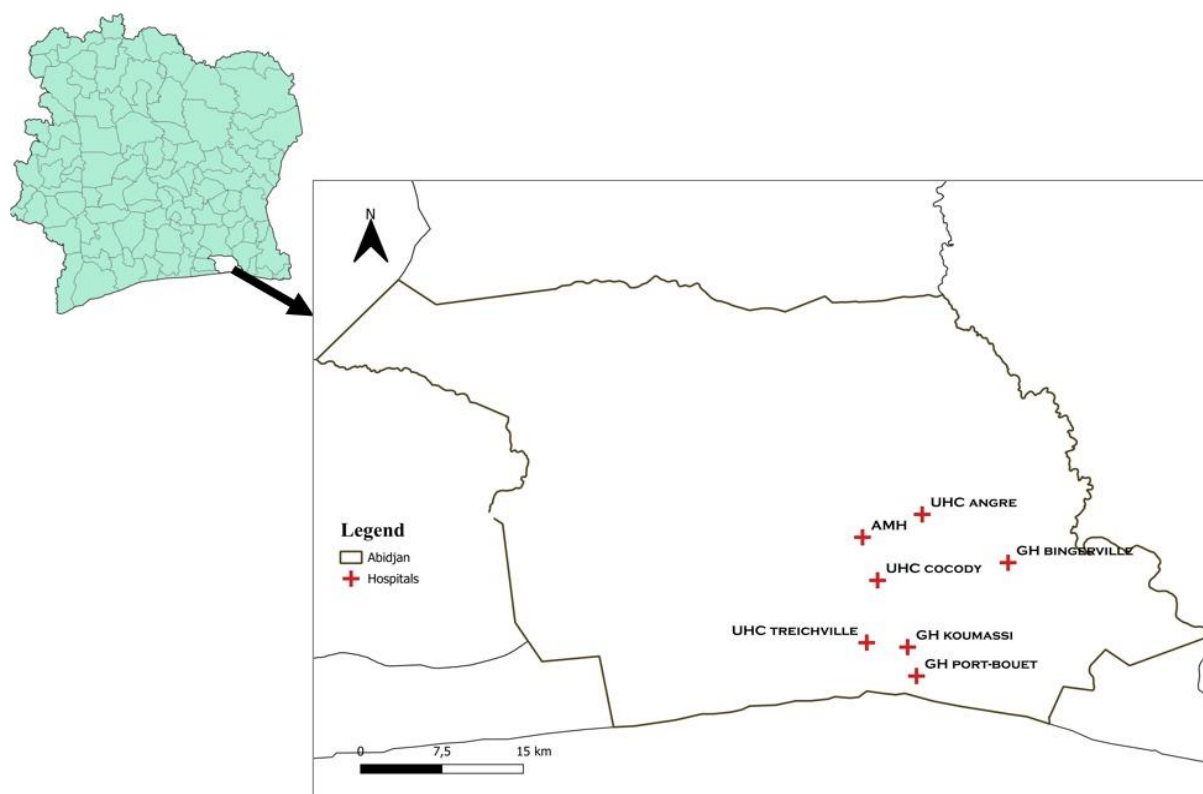


Figure 1. Map of Abidjan including the study areas. UHC: University Hospital Center, AMH: Abidjan Military Hospital, GH: General Hospital.

responding to the questionnaire out of 330 persons, resulting in a participation rate of 85.2%. The sample showed a strong female predominance, with 72.2% women and 27.8% men, yielding a sex ratio of 0.38. The majority of practitioners (69.4%) were concentrated in the 30-50 age group, while 20.6% were under 30 years old, and 10.0% were over 50 years old. The average age was 37 years (standard deviation = 8), with ages ranging from 22 to 66 years. Regarding professional distribution, midwives comprised 61.2% of the respondents, followed by gynecologists at 32.7%. Medical students and hospital interns accounted for 3.2 and 1.4%, respectively (Figure 2).

Knowledge of female genital schistosomiasis

Practitioners' knowledge of FGS was assessed, based on their responses concerning the pathogen and its mode of contamination, clinical signs of the disease, diagnosis, treatment and preventive measures. According to knowledge level of FGS epidemiology, only 57% of respondents knew that *S. haematobium* is the parasite involved in the transmission of this parasitic disease. The transmission mode linked to chronic urinary

schistosomiasis was poorly known by 44.5% of practitioners. Transcutaneous transmission by furcocercaria was unknown (0.46%). The organs affected by female genital bilharzia were known in 77.1% of cases, namely the genital organs (vagina, uterus, fallopian tubes and ovaries). Bladder involvement was reported in 22.9%. Respondents were less aware of the consequences of FGS. Thus, infertility and cervix cancer together accounted for 40.56% of responses, while the higher risk of HIV infection was known in only 9.6%. Table 1 shows the different answers given by practitioners on the pathogen of female genital schistosomiasis, transmission mode and affected organs.

Regarding the biological diagnosis of female genital schistosomiasis, the most frequent albeit incorrect, answer was microscopic examination for detecting parasite eggs in urine or other excreta. The history of the patient's clinical signs as a way of diagnosis accounted for 23.4% of responses, followed by histological examination of sampled tissues, which accounted for 18.6%. Pelvic examination and visual examination of the genital tract were fewer known with 10.9 and 0.2% respectively, despite the fact that they are also diagnostic tools for FGS. In the absence of diagnostic tools, 19.4% of practitioners associated FGS with contact with fresh

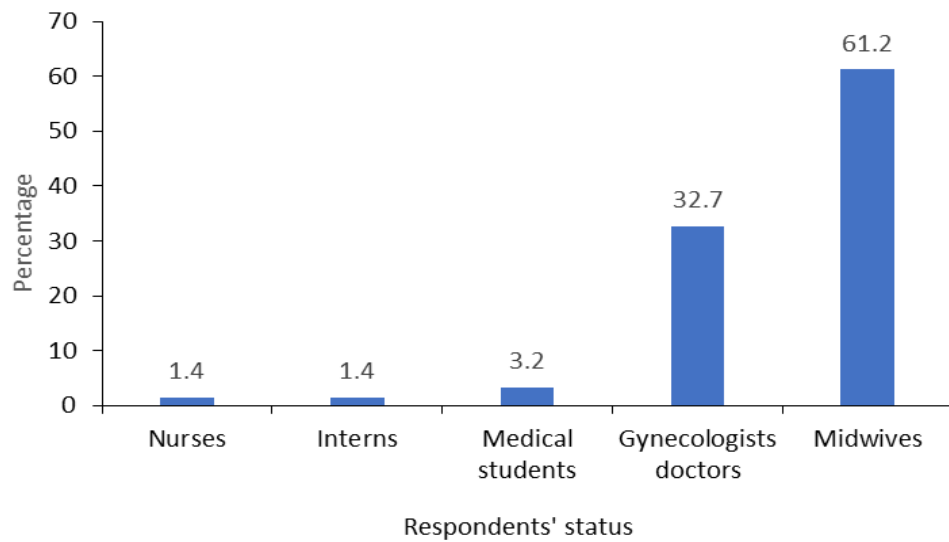


Figure 2. Distribution of included population by their professional status.

Table 1. The answers of practitioners on the pathogen agent of female genital schistosomiasis, transmission mode, affected organs and clinical consequences.

Parameter	Number	Percentage	p-value
Pathogen agent (n=238)			
<i>Chlamydia trachomatis</i>	22	9.2	<0.0001
<i>Schistosoma haematobium</i> *	136	57.1	
<i>Schistosoma intercalatum</i>	16	6.7	
<i>Schistosoma mansoni</i>	55	23.1	
<i>Treponema pallidum</i>	9	3.8	
Transmission mode (n=218)			
Sexual transmission	39	17.9	< 0.0001
Chronicity of urinary schistosomiasis*	97	44.5	
Contact with the fluids of an infected person	81	37.2	
Transcutaneous mode*	1	0.5	
Affected organs (n=594)			
Vulva/Vagina*	169	28.5	0.0876
Uterus*	164	27.6	
Fallopian tubes*	60	10.1	
Ovaries*	65	10.1	
Bladder	136	22.9	
Clinical consequences of FGS (n=429)			
Bladder cancer	2	0.5	< 0.0001
Ectopic pregnancies	70	16.3	
Recurrent infections	142	33.1	
Cervix cancer*	88	20.5	
Infertility*	86	20.1	
High risk of HIV infection*	41	9.6	

*True answers.

Table 2. Different answers from respondents about the diagnosis of female genital schistosomiasis.

Parameter	Number	Percentage	p-value
Diagnostic tools (n=457)			
Visual examination of the genital tract*	1	0.2	<0.0001
Blood test	54	11.8	
Patient's clinical history	107	23.4	
Microscopic search for parasite eggs eggs in urine or other excreta	160	35.0	
Pelvic examination*	50	10.9	
Histological examination of tissue	85	18.6	
Affirmation of disease in the absence of diagnostic tool (n=723)			
Abdominal pain*	97	13.4	0.0034
Abnormal discharge*	61	8.4	
Bloody discharge	28	3.9	
Contact with fresh water in an endemic area*	140	19.4	
Genital ulceration*	43	6.0	
Chronic diarrhea	28	3.9	
Dysuria	79	10.9	
Terminal hematuria	136	18.8	
Genital burning sensation*	111	15.4	

*True answers.

water in endemic areas of urinary schistosomiasis. In 18.8% of cases, terminal hematuria was reported as a potential diagnostic indicator, even though these symptoms most often correspond to signs of early infestation. Symptoms such as genital burning, abdominal pain and abnormal discharge were declared by 37.2%. Other arguments such as genital ulceration and contact with fresh water in an endemic area were known at 95.9 and 19.4%, respectively. Table 2 shows the different answers given by respondents about the diagnosis of female genital schistosomiasis.

Regarding treatment and prevention of FGS, 66.8% of practitioners knew that praziquantel-based treatment is effective. Some respondents (7.7%) believed the best treatment was a combination of albendazole and praziquantel. The control strategies for FGS mentioned by practitioners included avoiding bathing in freshwater (28.4%) and not passing feces and urine into freshwater (28.1%). Other disease control strategies were less well-known, such as mass treatment with praziquantel (4.6%) and the bilharzia vaccine currently under development, "Bilhvax" (0.1%). Table 3 outlines the respondents' answers on FGS treatment and prevention.

Experiences on female genital schistosomiasis

Practitioners' experiences with FGS were evaluated based on case reception and pelvic examination practices. Only 5% of practitioners reported having received or suspected FGS cases in their health centers.

For managing these cases, 53.8% conducted infectious tests and other complementary analyses, while 15.4% requested biopsies to detect eggs in tissues. Colposcopy was used in only 7.7% of cases, and some practitioners referred cases to more specialized structures.

Regarding treatment, of the 13 practitioners who suspected FGS cases, 8 followed the patients through to the end, and 50% used praziquantel. However, others used antibiotics (25%), metronidazole (12.5%), or amphotericin B (12.5%), which is not indicated for FGS treatment. Table 4 details the practitioners' experiences with FGS cases.

Pelvic examination to detect FGS symptoms was performed by only 26% of practitioners. During pelvic examinations, the most frequently identified clinical signs were metrorrhagia (43.9%), inflamed and hemorrhagic cervix on contact (26.8%), vaginal lesions, leucorrhea, and uterine mass (7.3%), and increased uterine and vaginal volume (4.9%). Tissue biopsy, a diagnostic method for FGS, was requested by 24% of practitioners, and 3% revealed the presence of *S. haematobium* eggs, confirming the diagnosis. Table 5 outlines the practitioners' experiences with pelvic examinations.

DISCUSSION

This study on healthcare workers' knowledge and experience of FGS is one of the few conducted in sub-Saharan Africa, particularly in Côte d'Ivoire. The predominantly female gender distribution aligns with the

Table 3. Different answers from respondents about the treatment and prevention of female genital schistosomiasis.

Parameter	Number	Percentage	p-value
Treatment of FGS (n=186)			
Metronidazole	1	0.5	
Ciprofloxacin	8	4.1	
Doxycycline	13	6.7	
Albendazole	9	4.6	
Praziquantel	130	66.7	
Combination doxycycline, ciprofloxacin	3	1.5	<0.0001
Combination ciprofloxacin, praziquantel	1	0.5	
Combination doxycycline, ciprofloxacin, albendazole	3	1.5	
Combination doxycycline, albendazole	2	1.0	
Association doxycycline, praziquantel	7	3.6	
Combination praziquantel, albendazole	15	7.7	
Acyclovir	3	1.5	
Control strategies of FGS (n=726)			
Boil water before consumption	91	12.5	
Avoid passing feces and urine in fresh water	204	28.1	
Avoid drinking untreated water from suspected sources	138	19.0	<0.0001
Avoid swimming in fresh water	206	28.4	
Massive drug administration using praziquantel	33	4.6	
Vaccination against schistosomiasis (Bilhvax)	1	0.1	
Use of condoms for sexual relation	53	7.3	

Table 4. Different answers from respondents according to their experience of receiving cases of FGS in their healthcare center.

Parameter	Number	Percentage	p-value
Suspicion of BGF cases (n=281)			<0.0001
No	268	95.4	
Yes	13	5.6	
What to do in suspecting FGS cases (n=13)			0.574
Complementary tests	3	23.1	
Infectious tests	4	30.8	
Physical examination	1	7.7	
Colposcopy with positive result	1	7.7	
Biopsy for histological examination (one positive case)	2	15.4	
Patient treatment	1	7.7	
Transfer to specialized health facilities	1	7.7	
Treatment of FGS (n=8)			0.392
Amphotericin B	1	12.5	
Antibiotics	2	25.0	
Praziquantel	4	50.0	
Metronidazole	1	12.5	

field of gynecology, where midwives comprise the majority of the workforce. This finding is consistent with a study reporting a high proportion of women (Gyapong et

al., 2024), but differs from other studies that reported low female participation rates (Aribodor et al., 2023; Mazigo et al., 2024), likely due to the specific focus on

Table 5. Different answers from respondents according to their experience in performing pelvic examinations.

Parameter	Number	Percentage	p-value
Performing a pelvic examination (n=281)			
No	209	74.4	0.0001
Yes	72	26.6	
Symptoms during pelvic examination (n=41)			
Enlarged uterus and vagina	2	4.9	<0.0001
Inflammatory and hemorrhagic cervix on contact	11	26.8	
Vaginal lesions	3	7.3	
Leucorrhea	3	7.3	
Metrorrhagia	18	43.9	
Uterine mass	3	7.3	
Vaginal warts	1	2.4	
Histological examination performing (n=281)			
No	213	75.8	0.0023
Yes	68	24.2	
Presence of <i>S. haematobium</i> eggs on histological examination (n=68)			
No	66	97.1	0.0012
Yes	2	2.9	

gynecology services.

The majority of practitioners surveyed were in the 30 to 50 age group, with young practitioners under 30 accounting for 21% of the sample. This proportion is higher than that reported in another study (Aribodor et al., 2023), indicating the involvement of young professionals in gynecology services. The survey showed a predominance of midwives and gynecological physicians, differing from the findings of Gyapong et al. (2024), potentially due to the specific services surveyed, namely obstetrics and gynecology.

While healthcare professionals were generally aware of urogenital schistosomiasis, their knowledge of the disease's impact on reproductive organs and the genital form was limited. Regarding epidemiology, most participants were moderately familiar with *S. haematobium* as the causative agent of FGS, consistent with another study (Mazigo et al., 2024). However, only 44.5% knew about the link between FGS and chronic urinary schistosomiasis, highlighting a knowledge gap in transmission modes (Mazigo et al., 2021).

Regarding the clinical signs of the disease, half of the respondents had a good knowledge of metrorrhagia as a symptom. Furthermore, a study carried out in the Democratic Republic of Congo showed that more than 80% of practitioners were unaware of the symptoms of FGS (Wambui et al., 2024).

The clinical signs of FGS were not well-known among

practitioners, with only half recognizing metrorrhagia as a symptom. Diagnostic methods were also poorly understood, with few mentioning clinical signs and patient history as diagnostic indicators. The pelvic examination, a definitive diagnostic method (Valls et al., 2023), was not well-known, and practitioners often confused FGS diagnosis with that of urinary schistosomiasis. These findings suggest a need for training on FGS diagnosis and management among healthcare professionals (Mazigo et al., 2024; Wambui et al., 2024).

Regarding treatment knowledge, the majority of practitioners identified praziquantel as the main treatment against FGS, as reported in some studies in which most practitioners knew that praziquantel was the drug indicated for this disease (Aribodor et al., 2023; Kéita et al., 2021; Wambui et al., 2024). In parallel, other molecules such as albendazole, doxycycline, ciprofloxacin, which do not respond to the treatment protocol for FGS, have been mentioned in this study. Some drug combinations, for example, doxycycline-praziquantel, and ciprofloxacin-praziquantel, have been indicated as an alternative to treat co-infections or associated symptoms. This shows that some practitioners often seek to diversify treatments in the absence of clear guidance due to lack of knowledge of FGS therapeutic protocols. The treatment with the albendazole-praziquantel combination reported in this series reflects a lack of knowledge about the anti-

parasitic used against FGS (Basile et al., 2023). These results, although encouraging, above all show the link that practitioners make between FGS and urinary schistosomiasis for the treatment of the disease (Umbelino-Walker et al., 2023).

For prevention measures of FGS, few practitioners cited strategies based on fecal hygiene and observing certain habits and behavior such as avoiding swimming in fresh water and eliminating stool and urine in fresh water. These results show low knowledge of the disease control strategies, which differs from the results of a recent study (Wambui et al., 2024). Moreover, some practitioners mentioned avoiding drinking untreated water from contaminated sources and boiling water before consumption as ways of prevention, showing poor knowledge on disease prevention strategies reported in another study (Gyapong et al., 2024; Vlassoff et al., 2022). Furthermore, massive drug administration using praziquantel was little known, despite its demonstrated role in reducing the prevalence of schistosomiasis in endemic communities.

Regarding practitioners' experiences in the management of FGS, only 5% of suspected or encountered cases, unlike recent studies which reported that the majority of practitioners claimed to have encountered cases of FGS in their healthcare center (Aribodor et al., 2023; Wambui et al., 2024). This difference could be due to the low level of knowledge about this disease. The location of this study, that is, Abidjan, which is not a strong endemic area for urinary schistosomiasis, and the professional environment in which the treatment of sexually transmitted infections is more regular than those of schistosomiasis would explain this low suspicion of FGS cases by practitioners, as demonstrated in a previous study (Basile et al., 2023; Masong et al., 2021).

Furthermore, very few practitioners requested a biopsy to analyze the vaginal tissues and performed a colposcopy, which are definitive diagnostic examinations in the event of suspicion of FGS. Only half of the practitioners suspecting a case of FGS prescribed praziquantel. The lack of knowledge about treatment is a major problem for better management of the disease (Kéita et al., 2021). The pelvic examination, which is the most recommended diagnostic method for female genital schistosomiasis, was carried out by only 26% of practitioners who had suspected cases. A recent study also showed this diagnosis method was very rarely carried out in healthcare centers (Kéita et al., 2021; Wambui et al., 2024).

This alarming reality reflects a lack of knowledge and a lack of training regarding this practice, which is nevertheless fundamental in the identification of suspected FGS cases. This is highlighted in studies reporting that health professionals lack awareness of the importance of the pelvic examination (Aribodor et al.,

2023; Wambui et al., 2024). In addition, this lack of performance of a pelvic examination could also be due to the lack of equipment allowing the diagnosis of FGS (Mazigo et al., 2022).

Among the practitioners who performed the pelvic examination, metrorrhagia was the most frequently observed clinical sign, as well as an inflammatory and hemorrhagic cervix upon contact. These responses indicate partial knowledge of the manifestations of FGS during the pelvic examination. The histological examination, which allows the confirmation of suspected cases, was very little requested by the practitioners interviewed (Kéita et al., 2021). This limits the possibilities of confirming FGS.

Histological examination, although recognized as a reference method (Piotrowski et al., 2023), remains underused, probably due to the inaccessibility of specialized laboratories and adequate equipment (Aribodor et al., 2023; Wambui et al., 2024). This study has some limitations. Thus, the disease being very little known among women's health professionals, a large part of the practitioners refused to participate in the study. Some health structures refused to allow the study to be carried out in their departments, while others did not respond to the study invitation. In addition, some health professionals did not answer certain questions.

Conclusion

This study highlights that FGS is poorly understood by practitioners, posing risks of incorrect diagnosis and inappropriate treatment due to healthcare professionals' lack of information. This knowledge gap may also lead to underestimating the disease's impact, resulting in an additional burden on the healthcare system in endemic areas. Implementing training and awareness-raising programs for healthcare personnel is crucial to preventing consequences for women in areas at risk of urinary schistosomiasis. Developing common protocols for early diagnosis and treatment is urgently needed to address this issue.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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