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ORIGINAL ARTICLE

Assessing the knowledge, training and capacity of health workers in the diagnosis and management of soil-transmitted helminths and schistosomiasis in eastern Uganda

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Background: Neglected tropical diseases (NTDs) affect millions of people in Africa, with Uganda bearing a significant burden. The World Health Organization (WHO) set a goal to reduce NTDs and improve access to diagnosis and management by 2030. However, NTDs have not been well integrated into primary healthcare in many countries, including Uganda, due to limited knowledge and resources among health workers. The study aimed to assess the readiness and capacity of primary healthcare centres to diagnose and manage soil-transmitted helminths (STHs) and schistosomiasis.

Methods: A cross-sectional quantitative study was conducted among 204 health workers in 20 health facilities in four districts bordering Lake Kyoga. In this study we evaluated health workers' knowledge of symptoms, diagnosis and management of STHs and schistosomiasis as well as the availability of resources and training.

Results: Our findings indicate that health workers have strong knowledge about STHs (86.76%), with lower knowledge levels regarding *Schistosoma haematobium* (59.72%) and *Schistosoma mansoni* (71.43%). Regarding resources and training, 95% of health facilities had laboratory services, but the majority lacked diagnostic equipment. Furthermore, only 17% of health workers reported prior training on schistosomiasis and related topics and only 25% had training on surveillance and reporting.

Conclusions: While health workers in eastern Uganda demonstrated a good knowledge base for some NTDs, there were knowledge gaps and challenges in training on surveillance and reporting mechanisms. Continuously building the capacity of health workers along with investing in diagnostic infrastructure is essential for improved NTD control and ultimately reducing associated morbidity and mortality in the region.

Introduction

Globally, neglected tropical diseases (NTDs) currently affect >1 billion people, with another 1 billion at risk of infection.[1–7] NTDs have devastating effects on the health, well-being and socio-economic facets of one's life.[3,8,9] Africa is disproportionately affected, accounting for more than two-thirds of the global burden, with cases concentrated in poor rural communities.[2,3,10] In 2016, 11 million people worldwide reportedly did not receive treatment for NTDs.[10] Uganda is endemic for all five NTDs targeted by the US Agency for International Development's Act to End NTDs, including soil-transmitted helminths (STHs), schistosomiasis, lymphatic filariasis (LF), trachoma and onchocerciasis.[10–13]

NTDs are preventable and can be eliminated. In 2013, the World Health Organization (WHO) set a target of 90% reduction in the number of infections and 100% of the population having free access to diagnosis and management of NTDs by 2030.[4] The WHO further resolved to have numerous strategies implemented in the member states in order to achieve these goals.[4] These included integration of NTDs into primary healthcare (PHC), ensuring that healthcare workers are in a position to diagnose, manage and report these cases in the Health Management Information System (HMIS).[4,14] This strategy ensures that

guidelines on the management of NTDs and medical supplies are readily available, as well as the inclusion of NTDs in public health packages.[4,14] Despite the burden of NTDs in sub-Saharan Africa, NTDs have not been well integrated in PHC in most countries. Studies in Nigeria, Tanzania and Burundi reported that health workers had low capacity and readiness to diagnose and manage NTDs.[2,15,16] In particular, they had inadequate knowledge and skill in understanding, diagnosing and managing NTDs, which hinders the control and elimination of these diseases.[2,15,16] Furthermore, management of NTDs is not holistic and largely focuses on the biomedical aspect, with less attention on other aspects of these diseases.[17]

The prevalence of NTDs in Uganda is high, especially in rural areas, with STHs (26.5%) and schistosomiasis (26.6%) having the highest.[18–20] Management of NTDs is predominantly in lower-level health facilities (health centres 3 and 4).[18–20] The increased burden along lake shores could be due to the poor sanitation and lakes being a habitat for snails that harbour disease-causing pathogens. Currently the country's approach to NTDs entails the use of integrated control programs.[14] The Ministry of Health has cited a lack of knowledge, skills and equipment to diagnose and manage NTDs in health facilities, as well as the poor reporting systems, as bottlenecks to elimination of NTDs by 2030[20] There is a paucity of information regarding these bottlenecks. Exploring the readiness and capabilities of PHC facilities to diagnose and manage NTDs is essential, as this will act as a baseline to track progress. In this study, we set out to assess the readiness and capacity of PHC centres to diagnose and manage STHs and schistosomiasis.

Methods

Study design, area and population

This was a cross-sectional quantitative study among health workers in level 3 and 4 health centres in the Kayunga, Serere, Buyende and Kaliro districts conducted in April–May 2023. The districts border Lake Kyoga, an area known for a high prevalence of STHs and schistosomiasis. Data were collected from 20 health facilities across the previously mentioned districts that serve 50 patients per week. A total of 204 health workers participated in the study.

Sample size determination and sampling

The sample size was calculated using the modified Kish equation for a general population of 400 health workers.[21,22] A minimum sample size of 197 participants was determined and data were collected from 204 participants selected by consecutive sampling from 20 health facilities. All health facilities from which participants were recruited were assessed on the diagnosis and management of STHs and schistosomiasis.

Study procedure

The study adapted a questionnaire from previous studies in Tanzania and Burundi.[15,16] The questionnaire was then pre-tested on healthcare workers under internship at Mulago National Referral Hospital and corrections made. The questionnaires collected information on sociodemographic characteristics such sex, marital status, type of health facility and cadre of health personnel. The questionnaires also collected data on knowledge of symptoms and management of STHs and schistosomiasis.

The health facilities were also assessed using a structured questionnaire that collected data on the diagnosis and treatment of STHs and schistosomiasis (diagnosis [how STHs and schistosomiasis are diagnosed, availability of laboratory space in the health facility, availability of laboratory space and diagnostic manuals], treatment [availability of essential medicines for the management of STHs and schistosomiasis] and laboratory equipment [microscope, object and cover slides, centrifuge, membrane filters, filter holders, syringes, centrifuge tubes, iodine, urine dipstick, malachite green, methylene blue, glycerine solution 50%, cellophane, Kato–Katz template, spatula]).

Four trained graduates with medical doctor degrees who were waiting to start their internships were recruited as data collectors/research assistants. All received a 2-d training and participated in pre-testing of the data collection tool and field data collection. Participants were approached, consented and given the structured self-reported questionnaires that were then completed.

Operational definition

NTDs in the study were considered to be STHs and schistosomiasis.

Study variables

Independent variables

Sociodemographic information such as age, gender (male, female), education level (bachelor's degree, certificate, diploma, masters), position held at the health facility (according to Ministry of Health guidelines) and type of health facility (health centre 4, health centre 3, district hospital) were considered independent variables. Other independent variables included any previous training on NTDs (STHs, schistosomiasis), any previous training on NTD surveillance reporting, ever been visited for supportive supervision for NTDs (yes/no), ever received a penalty for not reporting an NTD (yes/no), does reporting of NTDs require monetary incentives (yes/no) and is the reporting form on NTDs easy to complete (yes/no).

Dependent variables

Our dependent variables were knowledge of the health workers of the symptoms and management of STHs and schistosomiasis. Knowledge was assessed using 'yes' or 'no', with correct answers scoring 1 and incorrect answers scoring 0. The scores ranged from a minimum of 0 to a maximum of 23. The participants were classified as having high knowledge (>16 [75%]), moderate knowledge (50–74.9%) and low knowledge (<50%).

Statistical analysis

Fully completed questionnaires were collected into KoboToolbox (https://www.kobotoolbox.org), an online survey tool. and

extracted into an Excel 2016 spreadsheet (Microsoft, Redmond, WA, USA), cleaned, coded and exported to R version 4.3.0 (2023-04-21 ucrt) for analysis (R Foundation for Statistical Computing, Vienna, Austria). Numerical data were summarized as means, standard deviations (SDs) and medians. Categorical data were summarized as frequencies and proportions.

Results

Characteristics of health facilities

There was a total of 20 health facilities from four districts that participated in the study, with 65% (n=13) being level 3 health centres and the rest being level 4 health centres.

Characteristics of health workers at the facilities

A total of 204 health workers participated in the study; 52% were male. The majority of them were nurses (54%) and laboratory technicians (24%), followed by clinical officers, dispensers and doctors. Education levels varied, with the majority being certificate and diploma holders, as well as holders of bachelor's or master's degrees, as described in Table 1. Doctors were found to have the highest knowledge, with the others having a fair distribution of high, moderate and low knowledge on NTDs.

NTD training and surveillance

The health workers were assessed on basic training that may have been given to them about NTDs and surveillance. Only 17% of the participants had received prior training in schistosomiasis and other related topics, while 25% had received training in surveillance and reporting. Among those who had received training, 53.1% had completed their training within the past year. Additionally, 28% of health workers reported that they had never received supportive supervision for NTDs, and the majority (94%) stated that they had not faced penalties for failing to report NTDs. Nearly half (47.5%) found NTD reporting forms challenging to complete, and 35% of health workers believed that financial incentives were needed to encourage NTD reporting.

Knowledge on symptoms of NTDs

Health workers were assessed on their basic knowledge of NTDs, in this case STHs and schistosomiasis. Table 2 details responses given by the interviewed health workers.

Schistosoma haematobium

Knowledge on schistosomiasis varied among the species *S. haematobium* and *Schistosoma mansoni*. Table 2 summarizes responses given. Knowledge on *S. haematobium* was lower than that of STHs, especially on identification of signs and symptoms. The most common symptoms mentioned included haematuria and anaemia, known by 85% of health workers. Other symptoms

Table 1. Characteristics of health workers and facilities participating in the study.

Variable	Values
Age (years), n (%)	
Mean±SD	35.39±9.49
<25	29 (14.2)
26–44	143 (70.1)
>45	32 (15.7)
District, n (%)	
Buyende	63 (30.9)
Kaliro	32 (15.7)
Kayunga	51 (25.0)
Serere	58 (28.4)
Gender, n (%)	
Female	98 (48)
Male	106 (52)
Facility type, n (%)	
Health centre 3	116 (57)
Health centre 4	88 (43)
Type of health worker	
Clinical officer	35 (17.16)
Dispenser	3 (1.47)
Doctor	3 (1.47)
Laboratory personnel	52 (25.49)
Nurse	111 (54.4)
Education, n (%)	
Bachelor's degree	18 (8.8)
Certificate	91 (44.6)
Diploma	91 (44.6)
Master's degree	2 (1.0)
Other	2 (1.0)
Previous training on NTDs, n (%)	
No	170 (83)
Yes	34 (17)
Previous training on NTD surveillance reporting	
No	153 (75)
Yes	51 (25)
If yes, period since training, n (%)	
5 y	17 (34.7)
1 month	4 (8.2)
1 week	2 (4.1)
1 y	26 (53.1)
Ever been visited for supportive supervision for NTDs, n (%)	
No	147 (72)
Yes	57 (28)
Ever received a penalty for not reporting NTDs, n (%)	
No	192 (94)
Yes	12 (6)
Is the reporting form for NTDs easy to complete?, n (%)	
No	97 (47.5)
Yes	107 (52.5)
Knowledge, mean±SD (%)	
S. haematobium	3.58±1.52 (60)
S. mansoni	5.17±1.48 (74)
STHs	5.21±1.11 (87)
Management	2.25±0.86 (75)
Overall knowledge	16.22±3.54 (74)

Table 2. Knowledge of symptoms and management of STHs and schistosomiasis.

Variable	Frequency (%)
Medications used in the management of STHs and schistosomiasis	
Albendazole or mebendazole used for *A. lumbricoides*, *T. trichiuria* and hookworms	No 18 (9), yes 186 (91)
Ivermectin for *S. stercoralis*	No 95 (46.6), yes 109 (53.4)
Praziquantel used for schistosomiasis	No 39 (19), yes 165 (81)
Presentation of STH (hookworm, ascaris, whipworm etc.)	
Abdominal pain	No 6 (3), yes 198 (97)
Diarrhoea	No 12 (6), yes192 (94)
Anaemia	No 25 (12), yes 179 (88)
Chronic malnutrition	No 31 (15), yes 173 (85)
Cough	No 52 (25), yes 152 (75)
Reduced immunity	No 36 (18), yes 168 (82)
Symptoms of *S. haematobium*	
Haematuria	No 35 (17), yes 169 (83)
Anaemia	No 23 (11), yes 181 (89)
Nephrotic colic	No 101 (49.51), yes 103 (50.49)
Polyuria	No 115 (56), yes 89 (44)
Asthenia	No 130 (64), yes 74 (36)
Oliguria	No 89 (44), yes 115 (56)
Symptoms of *S. mansoni*	
Abdominal pain	No 13 (6), yes 191 (94)
Anaemia	No 30 (15), yes 174 (85)
Asthenia	No 134 (66), yes 70 (34)
Bloody stool	No 24 (12), yes 180 (88)
Diarrhoea	No 16 (8), yes 188 (92)
Haematemesis	No 87 (43), yes 117 (57)
Hepatosplenomegaly	No 69 (34), yes 135 (66)

that were mostly not known by the health workers included nephrotic colic, oliguria, asthenia and polyuria.

S. mansoni

Knowledge of *S. mansoni* (intestinal infection) was much higher than for *S. haematobium*, with the most common symptoms being abdominal pain (94%) and diarrhoea (92%). Other less-known symptoms of *S. mansoni* include bloody stool, hepatomegaly, asthenia and haematemesis.

STHs

Of the interviewed heath workers, all (100%) knew about STHs and their signs and symptoms, with the most common and best-known symptoms being abdominal pain (97%) and diarrhoea (94%). Other symptoms that were known by the majority of the participants included anaemia, chronic malnutrition and decreased immunity, with the least known symptom being cough (75%).

Management of NTDs

Health workers were also assessed on the management of NTDs. Overall, the majority (91%) knew about the management of STHs and schistosomiasis with albendazole and the use of mebendazole for *Ascaris lumbricoides*, *Trichuris trichiura* and hookworms. Fewer workers (81%) knew about the use of praziquantel for the management of schistosomiasis and only 53% knew about the use of ivermectin for schistosomiasis and STHs.

Health facility assessment of the management of NTDs

The study also assessed the health facilities for appropriate laboratory staff, diagnostic equipment and management protocols for reporting and management of NTDs. Notably, a high percentage (95%) of the surveyed facilities reported the presence of dedicated labs and lab technicians for NTD diagnosis, while diagnostic tests for intestinal schistosomiasis and STHs were available in 68% of the facilities. Clinical guidelines and protocols to guide diagnosis were present in 63% of the facilities. The reporting of diagnosis and treatment to the HMIS was universal (100%), and essential medicines for STH and schistosomiasis management were available in 58% of the facilities. Most facilities had essential laboratory equipment such as microscopes (100%) and centrifuges (58%). However, some items, such as Kato–Katz templates and malachite green, were notably absent. Table 3 highlights the presence or absence of laboratory equipment.

Table 3. Health facility readiness for management of STHs and schistosomiasis.

Variable	n (%)
Type of health facility	
Health centre 3	14 (74)
Health centre 4	5 (26)
District	
Buyende	4 (21.1)
Kaliro	5 (26.3)
Kayunga	5 (26.3)
Serere	5 (26.3)
Availability of dedicated lab and lab technician for diagnosis of NTDs	
No	1 (5)
Yes	18 (95)
Availability of diagnostic tests for intestinal schistosomiasis and STH	
No	6 (32)
Yes	13 (68)
Availability of clinical guidelines, laboratory protocols, or bench aids to guide diagnosis	
No	7 (37)
Yes	12 (63)
Reporting of diagnosis and treatment to the HMIS	
Yes	19 (100)
Availability of reporting forms at the health facility	
No	4 (21)
Yes	15 (79)
Availability of essential medicines for the management of STHs and schistosomiasis	
No	8 (42)
Yes	11 (58)
Microscope	
Yes	19 (100)
Object and cover slides	
No	1 (5)
Yes	18 (95)
Centrifuge	
No	8 (42)
Yes	11 (58)
Membrane filters	
No	15 (79)
Yes	4 (21)
Filter holders	
No	14 (74)
Yes	5 (26)
Syringes	
No	2 (11)
Yes	17 (89)
Centrifuge tubes	
No	8 (42)
Yes	11 (58)
Iodine	
No	9 (47.4)
Yes	10 (52.6)
Urine dipstick	
No	3 (16)
Yes	16 (84)
Malachite green	
No	19 (100)
Methylene blue	
No	1 (5)
Yes	18 (95)
Glycerine solution 50%	
No	18 (95)
Yes	1 (5)
Cellophane	
No	19 (100)
Kato–Katz template	
No	19 (100)
Spatula	
No	13 (68)
Yes	6 (32)
Distance of health facility from the town council (km), mean±SD (median)	13.89±15.65 (8)
Number of hospital beds, mean±SD (median)	25.05±21.19 (23)

Discussion

In this cross-sectional study involving 204 health workers, doctors were most knowledgeable as compared with the other workers. Half of the health workers had high knowledge on NTDs; however, health workers were more knowledgeable on STHs as compared with *S. mansoni*, *S. haematobium* and the management of three NTDs. No factors were associated with the level of knowledge of health workers in this study.

Knowledge of health workers

The management of NTDs hinges on the knowledge and capabilities of healthcare workers to accurately diagnose and treat these diseases. In our study, we found a strong knowledge base among healthcare workers in identifying symptoms and selecting appropriate medical treatments for STHs and schistosomiasis. This proficiency is pivotal in combating the spread of NTDs.

S. haematobium

Our study found a lower level of knowledge concerning *S. haematobium* (59.72%) compared with studies in Tanzania (96.2%) and Nigeria (78%).[2,16] This divergence may be attributed to the differential study designs and geographic contexts in each case. In Tanzania, even with fewer participants, the study homed in on healthcare establishments located along lake shores, where the likelihood of encountering patients with the disease is greater. Additionally, that study covered a large number of facilities, allowing for a more extensive knowledge base. In contrast, our

study included districts bordering lake shores but did not exclusively focus on healthcare facilities located on the shores. This difference in geographical scope could have led to variations in the knowledge levels observed, as healthcare facilities near the shores might encounter a higher volume of patients with the disease compared with facilities farther inland.

Consistent with the findings from Mazigo et al.'s study in Tanzania,[16] haematuria (98.7%), emerged as the most frequently acknowledged symptom of *S. haematobium* among health workers in our research (83%). Nonetheless, the reporting frequency was marginally less in our research than in the Tanzanian study, potentially reflecting the influence of geographical and patient population variations. Other identified symptoms such as polyuria, asthenia, oliguria and nephrotic colic in our findings agreed with results from previous research in Tanzania, Burundi and Nigeria,[2,15,16] illustrating common knowledge areas across different studies.

S. mansoni

The overall knowledge regarding symptoms of *S. mansoni* (71.43%) was found to be higher than that for *S. haematobium* (57.92%) in our study. However, it was lower than the reported knowledge levels in Tanzania (96%)[16] and Nigeria (78%),[2] although it was higher than what was observed in Burundi.[15] The variance in knowledge between our study and the one in Tanzania[16] is likely attributable to geographical and demographic differences among the healthcare facilities included in both investigations.

Comparing our findings with the study in Burundi,[15] the higher knowledge levels can be attributed to the fact that the Burundi study did not specifically focus on health workers, but rather included individuals in roles such as the person in charge of the healthcare facility (manager), the person handling consultations and patient referrals (care provider), the laboratory head, the pharmacy head and the individual responsible for case reporting (data clerk).

Similar to the Burundi study,[15] our research identified symptoms such as abdominal pain (94%), diarrhoea (92%), bloody stool (88%) and anaemia (85%). However, these percentages were higher than what was observed in the Burundi study,[15] where abdominal pain was reported at 43.1%, bloody diarrhoea at 13.9% and bloody stool at 7.7%. This difference can be attributed to the fact that our study participants were healthcare workers, who naturally possess a higher level of knowledge due to their professional roles.

Other symptoms reported in our study included asthenia (34%), haematemesis (57%) and hepatosplenomegaly (66%), which aligns with the findings in the studies conducted in Burundi[15] and Tanzania.[16] It is important to note that health workers primarily reported acute symptoms such as diarrhoea and abdominal pain as opposed to chronic symptoms like hepatomegaly, which are less frequently associated with schistosomiasis.

STHs

Our study revealed an impressive 86.76% level of awareness about STH symptoms among our respondent health workers. Their knowledge is particularly strong about hookworm, ascaris and whipworm, which are among the major STHs. The healthcare workers predominantly identified abdominal pain (97%), diarrhoea (94%), anaemia (88%) and chronic malnutrition (85%) as symptoms and, to a slightly lesser extent, cough (75%) and decreased immunity (82%).

Comparatively, the awareness levels reported in studies by Emeto et al.[2] in Nigeria and Bizimana et al.[15] in Burundi were notably lower. Nigerian respondents displayed only 37.3% awareness. This discrepancy could be partly explained by the fact that their study was conducted in semi-urban and urban areas, in contrast to our rural areas located near lake shores, which are associated with a higher prevalence of these diseases.

In the Burundi study,[15] the prevalence of recognized symptoms such as abdominal pain (69.2%) and diarrhoea (60%) was relatively lower, likely because our respondents were primarily healthcare workers. Owing to their professional roles, they would naturally have more extensive knowledge about the symptoms of STHs.

Management of NTDs

The understanding among healthcare workers about the medication involved in managing STHs and schistosomiasis was high, with a general knowledge level of 75.16%. A large proportion of respondents (91%) accurately named albendazole or mebendazole as the standard treatment for STH infections, including *A. lumbricoides*, *T. trichiura* and hookworms. Concurrently, more than half (53.4%) of the respondents showed awareness about the use of ivermectin for *Strongyloides stercoralis* infections. Furthermore, the primary drug for treating schistosomiasis, praziquantel, was correctly identified by a clear majority of respondents (81%).

The higher awareness of treatment options for STH infections compared with schistosomiasis could be attributed to healthcare workers' greater familiarity with STHs and possibly due to a higher prevalence of STHs in the study population. This may also be influenced by the study's focus on different geographical areas and healthcare settings. Compared with the study by Mazigo et al.,[16] respondents in our study were less knowledgeable about the use of praziquantel for schistosomiasis (91.3% vs 81%). This divergence can be attributed to variations in study designs and geographic contexts.

NTD training and surveillance

Our study reported 17% of the participants had received prior training in schistosomiasis, among other related subjects, a figure that falls short compared with the 48.5% reported in the Nigerian study,[2] yet surpasses the 8.1% and 9.2% for training on intestinal schistosomiasis and STHs reported by a study in Burundi.[15] Additionally, just 25% had been trained in surveillance and reporting, a number lower than the 68.3% recorded in Nigeria.[2] Among the trained, 53.1% had completed their instruction within the past year.

Regarding the practice of reporting, our study found that 28% of health workers reported having ever received supportive supervision for NTDs. In contrast, only 4% of the health workers reported having faced penalties for not reporting NTDs, a stark difference from the 37.3% penalty rate in the Nigerian study.[2] Moreover, 52.5% of our participants found NTD reporting forms

easy to understand and complete, whereas the Nigerian study reported a higher rate of 70.3% who found the forms easy to navigate.[2] Regarding the consideration of monetary incentives to stimulate NTD reporting, 35% concurred, compared with 43.6% in the Nigerian study.[2]

These disparities are likely the result of the rural status of our study area, which predominately consists of public health facilities as opposed to the urban and suburban biases of the Nigerian study,[2] inclusive of private facilities. Given that healthcare doubles as a business venture for private institutions, they place an emphasis on health worker knowledge, with regular training sessions. This may not necessarily be the case with public facilities. Moreover, urban and semi-urban populations hold an edge in terms of medical awareness over their rural counterparts. This heightened patient awareness may incentivize health facilities in urban settings, like in Nigeria, to invest more in training their health workers. In contrast, our study's rural setting may have fewer patient demands for such knowledge dissemination.

The differences in the settings of the two studies also account for the variations in penalties, supportive supervision and the need for financial incentives for NTD reporting. Urban and semi-urban areas are more likely to have stringent reporting mechanisms and greater enforcement, leading to higher penalties and a need for supportive supervision. Furthermore, the higher proportion of trained participants in the Nigerian study[2] explains why more of them found reporting forms easy to understand.

On the other hand, our study recorded higher training rates specifically in schistosomiasis and STHs. This discrepancy can be attributed to the fact that our study exclusively involved health workers, whose primary role is patient care. Consequently, they are naturally more motivated to acquire disease-specific knowledge to enhance patient management compared with individuals in other professions.

Capacity of health facilities

The presence of laboratory services in health facilities was substantially higher in our study with 95%, compared with a Tanzanian study that reported only 33.8% availability.[16] This is a crucial observation, as laboratory services play a key role in the diagnosis and management of several diseases.

Despite the WHO's recommendation to use advanced techniques such as urine sedimentation, centrifugation or filtration for diagnosing *S. haematobium*, and Kato–Katz or formalin–ether concentration for diagnosing *S. mansoni*, the availability of centrifuge tubes—necessary for these procedures—was at only 58%. A large majority of the facilities (84%) relied on urine dipsticks, reminiscent of the findings from the Tanzanian study.[16]

All surveyed facilities in our study had microscopes, meaning they were equipped to perform direct smear tests. This parallels reports from studies in Tanzania[16] and Burundi[15] citing the frequent use of direct smear tests. However, critical items like Kato–Katz templates, cellophane and malachite green were absent in all the facilities, mirroring the situation in Tanzania.

Our survey revealed that 63% of health facilities had guidelines and protocols in place, which is marginally above the 61.5% reported from a similar study conducted in Burundi.[15] These guidelines are pivotal for standardizing diagnosis and treatment procedures across health centres.

Limitations

This was a cross-sectional descriptive study that employed self-reported questionnaires and therefore is subject to information bias and did not establish causation. Despite this, findings from the study are very useful, as it will help inform policy and decision making towards NTDs. It will also provide useful information to improve knowledge, recognition and reporting among health workers on these diseases.

Conclusions

Health workers in eastern Uganda demonstrated a good knowledge base for recognizing and treating STHs and schistosomiasis. However, there were knowledge gaps, especially concerning *S. haematobium* and NTD management. Training, surveillance and reporting mechanisms showed room for improvement, with limited prior training, infrequent supervision and mixed perceptions about reporting forms. The majority of the health facilities had laboratory services but lacked diagnostic equipment.

To enhance the control of NTDs in eastern Uganda, it is critical to focus on several key areas based on the current assessment of health workers' knowledge and resources. First, continuous and comprehensive training programs should be established, targeting the existing gaps in knowledge, particularly concerning *S. haematobium* and broader NTD management strategies. These educational initiatives should be supported by improved surveillance systems, enabling more effective monitoring and response to disease outbreaks.

Additionally, the redesign and simplification of reporting mechanisms are essential to encourage consistent and accurate data submission from health workers, which is crucial for effective disease management and control strategies. Investment in the diagnostic infrastructure of health facilities is also imperative to ensure the availability of essential equipment for accurate diagnosis and treatment, addressing the current deficiencies and enhancing overall health service delivery.

Supplementary Data

Supplementary data are available at *Transactions* online.

Authors' contributions: RBK, TMK and JB developed the protocol. RBK and JB participated in data collection. RBK entered, cleaned and analysed the data. RBK, TM, LA and AMK developed the manuscript. RBK, TMK, LA, AMK and JB reviewed the manuscript. RBK and JB were responsible for the final editing. All the authors approved the final version of the manuscript.

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Ethical approval: The study received ethical approval from the Research Ethics Committee of Mbarara University of Science and Technology (MUST-2022-710). Permission to collect data from participants was granted by the district health officer as well as the facility in charge of the respective health facility. All participants provided voluntary informed written consent at study enrolment.

Data availability: The data set used in this manuscript has been provided as a supplementary file.

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