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Intestinal Helminths Infections and Predisposing Factors among Pupils from Selected Primary Schools in Kamuganguzi Subcounty, Kabale District, South Western Uganda

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Intestinal Helminths Infections and Predisposing Factors among Pupils from Selected Primary Schools in Kamuganguzi Subcounty, Kabale District, South Western Uganda

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Abstract- ***Background:*** Intestinal parasitic infections are a major health challenge in primary school children in Uganda. This study determined the prevalence of intestinal helminths infections and predisposing factors among pupils from selected primary schools in Kamuganguzi Sub County, Kabale District Western Uganda.

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Results: Out of 798 stool specimens collected and examined, 22.3% (178/798) tested positive for intestinal helminths with *Trichuristrichiura* and *Ascarislumbricoides* responsible for the cases. *Ascarislumbricoides* was the most prevalent with 96.7%, *Trichuristrichiura* with 3.3 % whereas 1.7% of the pupils had mixed infection of both *Ascarislumbricoides and Trichuristrichiura*. Anal cleaning practices (p-value 0.018) and water sources (p-value 0.002) were the main predisposing factors for the spread and maintenance of helminths infections in school going children in the study area.

Conclusion: Intestinal Helminths infections remains a health challenge among school going children in Kamuganguzi sub county; where *Ascaris lumbricoides and Trichuris trichiura* are responsible for infections. Poor anal cleaning practices and unreliable sources of water are the main predisposing factors for transmission and maintenance of Helminths infections in the study area.

Recommendations: There is need to increase access to safe and reliablewater sources in schools and to integrate anti-Helminths drugs admission with water treatment and community sensitization programs if parasitic infections are to be contained in this area.

Keywords: intestinal helminths, prevalence, south western uganda, pupils.

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I. Introduction

Intestinal helminths are intestinal parasites that inhabit the human gastrointestinal tracts and are one of the most prevalent forms of parasitic disease causing organisms attributed to physical and intellectual growth retardation (Abera & Nibret, 2014).Intestinal helminthiasis is caused by different species of worms especially in the group of round worms which include *Ascaris lumbricoides, Trichuris trichiura,* Hookworms *(Necator americanus* and*Ancylostoma duodenale), Strongyloides stercolaris, Taenia*species and schistosomes (Cheesbrough, 2005).

In sub Saharan Africa, intestinal helminth infections are common and of major health concerns because factors that predispose man to the infections are bound in the sub-region (Ijagbone & Olagunju, 2006).). Intestinal parasitic helminth infections are a major health challenge in primary school going children especially in developing countries (Mirisho, Neizer & Sarfo, 2017). Intestinal parasites cause high morbidity and mortality throughout Uganda (Hemant Kumar, 2014). This was associated with poor sanitation, lack of access to clean water, inadequate health facilities, and poverty (Adu-Gyasi et al., 2018).These infections cause iron deficiency anemia, growth retardation in children and other physical and mental health problems (WHO, 2012). About 610 million school age children worldwide are at risk of infection with common intestinal (Teshale *et al.*, 2018); most prevalent in the tropical and the subtropical areas where adequate clean water and sanitation facilities are lacking (Sun, 2015).

In Uganda, the prevalence of intestinal helminths infections among children is high estimated to be 82.1% due to *Hookworm,*18.9% *Ascaris lumbricoides*, 7.0% *Trichuris trichiura*, 1% *Enterobius vermicularis* and 0.5% for *H. nana* making it one of the leading countries with these infections in the world despite the government's efforts in the control(MoH Report, 2010). The study in selected districts of Central, Eastern, Northern, Karamoja, Westnile and Western regions where the most common STH were *Hookworms* (7.7%), *Trichuris trichiura*(1.3%) and *Ascaris lumbricoides*(0.5%).

Bundibugyo District had the highest prevalence infection with the prevalence of 24.9%, 4.1%, 4.1% and 28.2% for *Hookworm, Ascaris lumbricoides,Trichuris trichiura* and any infections of STH respectively (Adriko*et al*., 2018). In Hoima district, rural western Uganda, the prevalence is 26.5% (149/562); the prevalence of respective parasites included Hookworm 18.5% (104/562), 9.8% (55/562) for *A. lumbricoides* and 0.5% (03/562) for *T. trichiura (*Ojja *et al.,* 2018); While in Wakiso District-Central Uganda was 10.9% for *hookworm*, 3.0% for *Trichuria trichiura*, 1.9% for *Schistosoma mansoni* and 0.2% for *Ascaris lumbricoides* respectively (Lwanga,Kirunda & Orach, 2012).

A number of pupils in this study area have been noticed complaining of abdominal pains with the majority presenting with diarrhea (Kamuganguzi HC IV registers for the year 2018-2019).They do not routinely wash their hands after the latrine use and or before eating due to insufficient hand washing facilities and often defecate in the open due to inadequate latrine coverage; many pupils present with signs and symptoms of intestinal helminthiasis and cases have been reported among school going children in Kamuganguzi community. However, there is no clear documentation about the magnitude and predisposing factors of intestinal helminths infections in this area.

This study therefore sought to determine the prevalence of intestinal helminths infections and to establish the predisposing factors among pupils in selected schools of Kamuganguzi Sub County in Kabale, Western Uganda to fill this information gap. These findingstherefore enhance the level of awareness about the burden of intestinal helminthias is and predisposing factors key in guiding planning, broadening of control and preventive measures for intestinal helminths infections.

II. Materials and Methodology

a) Study area and design

The study was a laboratory and school based study using a descriptive cross sectional study design where both qualitative and quantitative approaches were employed.The study wascarried out inprimary schools of Kamuganguzi sub county, Kabale District, south western Uganda.

It is located on Kabale-Katuna highway, about 18 km from Kabale town and 2.5 km to Katuna border. Kabale District is located is in south western Uganda. it is a highland District at the coordinates $01^0$15`S $30^0$00`E with the altitude ranging between 1219metres (3999ft) and 2347metres (7700ft) above sea level. This altitude makes the area to be colder than rest of the country with a temperature average of 18^0C (64^0F) during the day and fall to about 10^0C (50^0F) at night. The relative humidity of the area is between 90% and 100% in the morning and decreases to between 42% and 75% in the afternoon all the year around.This sub county has eleven primary schools which include; Buhumba, Katenga, Kicumbi, Buranga, Kasheregyenyi, Kasaasa, Bunagana, Kikore, Kyasano, Butuza and Rutare primary school with a population size of about ten thousand pupils.

b) Sample size and study population

The sample size was 798 pupils estimated using Kish formula (Kish L, 1965) taking precision assumed to be +/- 0.05 at 95% level of confidence and taking 26.5% as prevalence of intestinal helminth infections in Hoima (Ojja *et al.,* 2018).This study included pupils from the selected primary schools of KamuganguziSub County, Kabale district.

The sub county has eleven primary schools which include; Buhumba, Katenga, Kicumbi, Buranga, Kasheregyenyi, Kasaasa, Bunagana, Kikore, Kyasano, Butuza and Rutare primary school. Eight primary schools were randomly selected from the eleven schools.The study considered pupils whose teachers/administration accented and those who met the selection criteria among the selected primary schools.

c) Sampling techniques

Simple random sampling technique was used to select eight schools from the eleven schools that are in Kamuganguzi Sub County. Papers were labeled 1-8 and other three papers were left blank. These papers were folded and put in a basin. Researchers then selected 11 teachers, at least one from each of the primary schools in Kamuganguzi Sub County and subjected them to picking one paper randomly from the pool of papers placed in a basin. Teachers who picked papers with numbers had their schools allowed to participate in the study.

Pupils were randomly sampled from every class including both boys and girls across the selected primary schools using class register. A maximum of one hundred pupils were selected from each school to participate in the study.On each day 100 stool specimens were collected from a single school and the samples analysed on the same day.

A pre tested, standardised interview guide was used to obtain the qualitative information from teachers and guardians about factors predisposing children to intestinal helminthic infections and also to collect demographic information concerning the study participants after obtaining the informed consent. For easy understanding of the questions asked to them, the questions were translated into Runyankole which is a native local language.

d) Sample collection and laboratory procedures

Researchers briefed and gave instructions of specimen collection to all study participants before specimen collection. All samples were collected aseptically in sterile, leak proof and labelled

containers.Samples were examined from Kabale Regional Referral Hospital Laboratory; stool samples were analysed macroscopicallyfor consistency, colour and for the presence of adult parasites and microscopically in direct wet techniques and formal ether concentration technique. Specimens were preserved in 10% formal saline.

e) Ethical considerations

The study was approved by Research Ethics Committee and Faculty of Medicine Research Ethics committee (Ref: MUST/MLS-031) at Mbarara University Science and Technology. Permission was sought from the district health officer Kabale district and from head teachers of selected schools. Informed consent was sought from all study participants, and their information was treated with confidentiality.

f) Quality control

Samples were transported to Kabale Referral Hospital for analysis and examination at ambient temperatures as soon as they were collected .Visual aids such as coloured plates and charts were used toconfirm the identity of the parasites or unusual structures.10% of examined specimen were proof read by a senior medical laboratory scientist for quality control

g) Data analysis and presentation

Data collected was cleaned and checked for completeness, errors, and consistence, entered in excel and transferred into SPSS version 20 for for descriptive data analysis and the outputs presented in frequency tables and graphs. Bivariate analysis was run using chi-square to establish factors associated with the prevalence of intestinal parasites. Factors with a p-value of 0.05 were considered statistically significant. The prevalence of intestinal parasitic infection was calculated and presented in frequency, percentages and table form.

III. Results

a) Socio-demographic characteristics of study participants

Seven hundred ninety eight (798) pupils were selected from eight primary schools in Kamuganguzi Sub County and interviewed with the aid of questionnaires to capture socio-demographic characteristics as shown in table 1.

Table 1: Socio-demographic characteristics of study participants

Variables	Frequency(n=798)	Percent (%)
Gender		
a) Male	372	46.6
b) Female	426	53.4
Age group (Years)		
a) <5	24	3
b) 6-10	456	57.1
c) 11-12	187	23.4
d) >12	131	16.4
Name of school (Primary)		
a) Kamuganguzi	100	12.5
b) Katenga	100	12.5
c) Buranga	100	12.5
d) Bunagana	100	12.5
e) Butuuza	100	12.5
f) Kisasa	100	12.5
g) Kasheregyenyi	99	12.4
h) Kicumbi	99	12.4
Total	798	100

Majority of study participants were female 53.4% (426/798); and belonged in 6 – 10 age group contributing 57.1% (456/798) of study participants.

b) Laboratory Findings

Prevalence of Intestinal helminthiasis and Helminths species isolated

From the laboratory findings, only two helminths species were isolated that is *Ascaris lumbricoides* and *Trichuris trichiura* with different proportions. Out of 798 stool specimens examined, 175/798 were positive for *Ascaris lumbricoides* and 06/798 were positive for *Trichuris trichiura* giving a prevalence of 21.9% and 0.75% respectively (Figure 1).

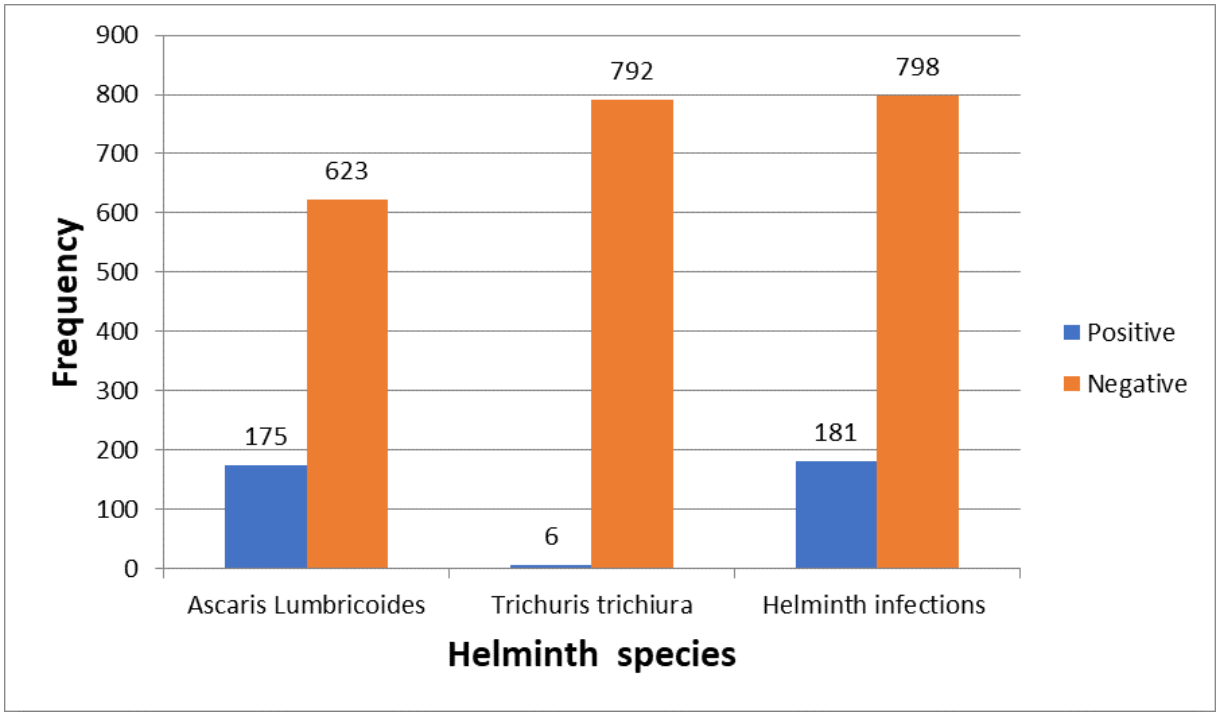

Figure 1: A bar graph showing the prevalence of intestinal helminths species isolated

Out of 798 stool specimens examined, 181/798 tested positive for intestinal Helminths infections giving an overall prevalence of 22.7% (Figure 2).

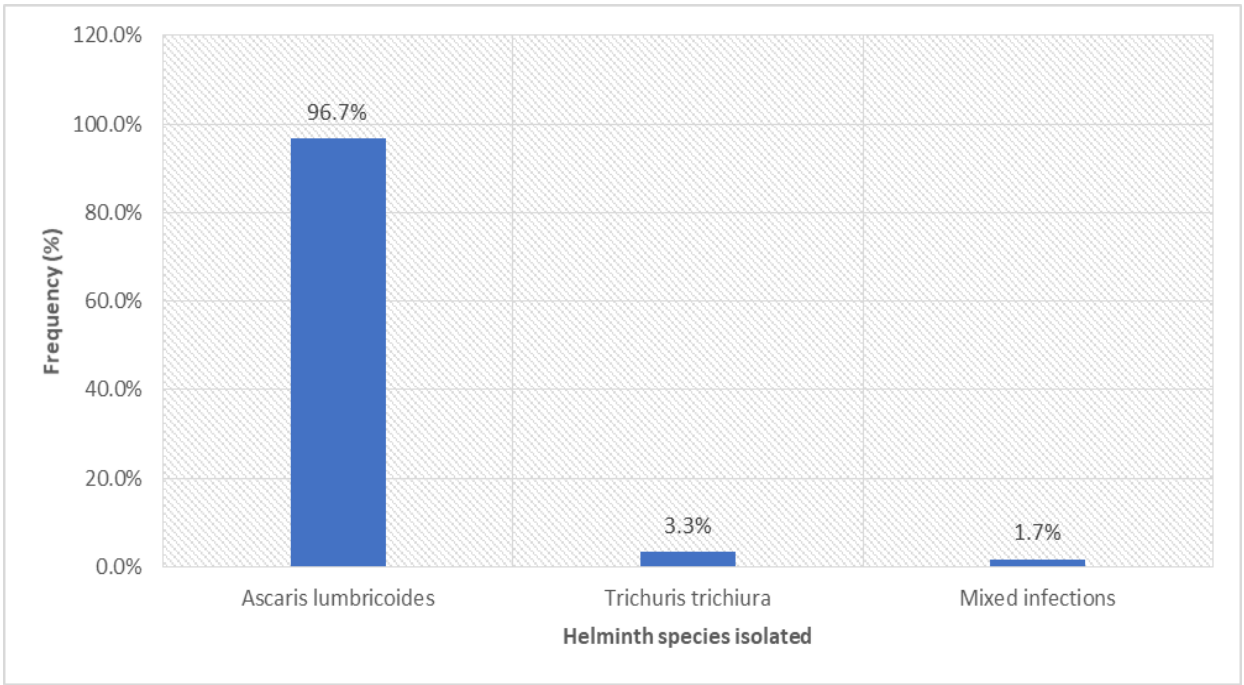

Figure 2: Shows the proportion of different intestinal Helminths responsible for intestinal Helminths infections

c) Most prevalent Intestinal Helminth species

Ascaris lumbricoides was the most prevalent helminths species responsible for 96.7% of all infections identified. However, 1.7% of mixed infections of both *Ascaris lumbricoides*and *Trichuris trichiura* were observed.

d) Predisposing factors to Intestinal Helminths infections

A questionnaire was used to capture predisposing factors and then a Chi square test carried out to determine the association helminths infections and to establish the level of significance (Table 2).

Table 2: The predisposing factors for intestinal Helminths infections among study participants

Variable	Frequency	Helminth infection		P-value
	Total (n)=798	Negative (%)	Positive (%)	
Gender				
Male	372	288(77.4)	84(22.6)	0.862
Female	426	332(77.9)	94(22.1)	
Age group (Years)				
<5	24	20(83.3)	4(16.7)	0.396
6-10	456	362(79.4)	94(20.6)	
11-12	187	138(73.8)	49(26.2)	
>12	131	100(76.3)	31(23.7)	
Defecation points				
Pit latrine	763	594(77.9)	169(22.1)	0.788
Stream	1	1(100)	0(0)	
Bush	33	24(72.7)	9(27.3)	
Bush and pit latrine	1	1(100)	0(00)	
Anal cleaning				
Plant Leaves	514	385(74.9)	129(25.1)	0.018
Donot clean	38	32(84.2)	6(15.8)	
Use papers	65	59(90.8)	6(9.2)	
Toilet papers	181	144(79.6)	37(20.4)	
Hand washing				
No	324	256(79)	68(21)	0.46
Yes	474	364(76.8)	110(23.2)	
Wash hands				
Before eating	1	1(100)	0(0)	0.814
After toilet	132	101(76.5)	31(23.5)	
Before food and after toilet	335	257(76.7)	78(23.3)	
Not applicable	330	261(79.1)	69(20.9)	
Materials used				
Water only	245	184(75.1)	61(24.9)	0.487
Soap and water	221	173(78.3)	48(21.7)	
Not applicable	332	263(79.2)	69(20.8)	
Water source				
Pond	316	228(72.2)	88(27.8)	0.002
Stream	208	168(80.8)	40(19.2)	

Tap	271	223(82.3)	48(17.7)	
Well	3	0(00)	3(100)	
Boiling water				
No	300	240(80)	60(20)	0.225
Yes	498	380(76.3)	118(23.7)	
Taking deworming tablets				
No	362	287(79.3)	75(20.7)	0.326
Yes	436	333(76.4)	103(23.6)	
When last took tablets				
1 month ago	25	21(84)	4(16)	0.301
Few days back	11	10(90)	1(19.1)	
Don't remember	161	116(72)	45(28)	
3 month ago	117	88(75.2)	29(24.8)	
6 month ago	14	97(80.2)	24(19.8)	
Not applicable	363	288(79.3)	75(20.7)	

Anal cleaning practices (P-value 0.018) and water sources (P-value0.002) were the only statistically significant predisposing factors associated to intestinal helminths infections in the study. There was no statistically significant association between age group, sex of children, hand washing, when washing hands, boiling water, taking tablets though they were reported to be contributing to the spread of Helminth infections.

IV. Discussion

Intestinal Helminths infections remains a health challenge among school going children in Kamuganguzi sub county; where *Ascaris lumbricoides and Trichuris trichiura* are responsible for infections. Poor anal cleaning practices and unreliable sources of water are the main predisposing factors for transmission and maintenance of Helminths infections in the study area

a) Prevalence of intestinal Helminths infections

Out of the total 798 pupils that were enrolled in our study, the overall prevalence of intestinal helminth infection was found to be 22.7%. This is slightly lower when compared to the studies carried out by Ojja *et al.,* (2018) in Uganda which showed that the prevalence of intestinal helminthes among the preschool-age children in Hoima District was 26.5%. The difference in prevalence could be due to the existing regular deworming programs in our study area. However, Mote, Makanga & Kisakye, (2005) in their study carried out in West Nile region Uganda to determine the prevalence of intestinal parasites among school children in Moyo district, found out that 42.6% were infested with at least one or a combination of up to three types of helminths which is higher than the 22.7% prevalence in our study area. The high prevalence in Moyo might be due to the climatic and environmental conditions of the area which could be more favorable for intestinal helminths since the temperatures are higher in Moyo than it is in Kabale and to some extent attributed to timing and seasonal differences in conducting the study.

According to other studies that were done among schoolchildren indifferent countries, the prevalence in this study is higher than that obtained by Mirisho, Neizer & Sarfo, (2017) among Children Attending Princess Marie Louise Children's Hospital in Accra, Ghana which was found to be 17.3% (39/225). Their low prevalence might be attributed to the laboratory method used since they did not use any concentration technique to increase chances of ova detection. However, Wani & Amin, (2016) in a study carried out among children of Kashmir valley in India found out that the prevalence of intestinal helminths was 75.28% which is very high as compared to our finding. The higher prevalence in their study is strongly attributed to the indiscriminate defecation of their study participants.

b) The most prevalent intestinal Helminths

Our study indicated that *Ascaris lumbricoides*was the most prevalent with 96.7% followed by *Trichuris trichiura* with 3.3 %. However, 1.7% of the pupils had mixed infection of both *Ascaris lumbricoides and Trichuris trichiura*. This disagrees with the previous

studies carried out in Hoima where the most prevalent intestinal helminth was found to be Hookworm.

The higher prevalence of *Ascaris lumbricoides*in our finding maybe attributed to the low temperatures and high atmospheric humidity in our study area that favors development of *Ascaris lumbricoides* as compared to the higher temperatures of Hoima that mainly favors Hookworm development.

c) *Predisposing factors to intestinal Helminths infections*

The study revealed majority of study participants or pupils were not practicing anal cleaning and regular hand washing; only 28% of those who washed hands used soap and water; majority of participants 64.3% used plant leaves for anal cleaning yet their cleanliness is unknown. This was attributed to lack of toilet facilities like toilet papers and hand washing facilities in their respective schools. This puts these group at a greater risk of getting infected with intestinal Helminths. This is consistent with the study Matthys *et al*., (2011) that showed that washing hands without soap after defecation is a major risk factor to intestinal Helminths infections. This shows the need for health education and sensitization about transmission, prevention and control of intestinal helminth infections on addition to provision of hand washing facilities

Majority of pupils 498/798(62.4%) were drinking boiled water only at home and were getting water from unsafe sources which included ponds and stream where water quality is doubted hence putting community masses at risk of acquiring parasitic infections. This is in line with the study by Doni *et al.*, (2015) that showed that children who use drinking water from rivers, streams, springs, and wells had a significantly higher prevalence of intestinal parasitic infection. Unless these trend of risky practices are minimized by provision of reliable and safe sources of water for domestic using, parasitic infections will remain a health challenge in this area and in these group of people resulting into poor quality of life

V. Conclusion

The study findings revealed that Intestinal Helminths infections remains a health challenge among school going children in Kamuganguzi sub county; where *Ascaris lumbricoides and Trichuris trichiura* are the Helminths species responsible for infections despite the existing control and preventive interventions.

Poor anal cleaning practices and unreliable sources of water are the main predisposing factors for transmission and maintenance of Helminths infections in the study area.

VI. Recommendations

There is need to increase access to reliable and safe water sources to the society, intensify the current preventive and control interventions like deworming and community health sensitization regarding hygienic practices.

There is need to integrate anti helminths drug administration, water treatment and community sensitization programs in the country if parasitic infections are to be contained in this area.

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Authors' Contributions

MD, AKW, OLJ and AA conceptualized the idea, designed the study, data collection and analyzed the data, interpreted the data, and drafted the manuscript. KR played a supervisory role and mentorship where he guided in designing the study, proposal generation and reviewed the proposal, data analysis, report and prepared the manuscript, MD also assisted in mobilization of study participants, laboratory procedures and data collection.

Conflict of interest

All authors declare no conflict of interest in the study.

Submission declaration and verification

The authors declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere.

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