Prevalence of Hookworm Infection and associated factors among Children below 14 years attending Outpatient Department at Kome Health Center III in Mukono District. A Cross-sectional Study.

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Abstract

Background:
Hookworm is one of the under-researched and neglected tropical diseases responsible for 90 million cases among children and in Uganda its degree is not well-known.

Methodology:
A cross-sectional study was done at Kome health center III where 58 children were recruited between January and February using a simple random sampling method and tested for Hookworm infection. Additional data was obtained using Questionnaires to find out the associated factors and the most affected age among children below 14yrs. Data analysis was done using Microsoft Excel.

Results:
In the study, the sample size was 58 participants. Out of these, 6 /58 were infected giving a percentage of 10.3%, and the remaining 52 children were not infected with Hookworm. Children between 11-14 yrs. were the most affected (4/6) followed by those aged ≤5yrs and 6-10(16.7%) respectively. males were more infected than females. The infection was high among those who didn't wash their hands, those who were not dewormed (6/6), and those who walked barefooted (4/6) cases of hookworm**.** All children attended from the rural areas

Conclusion:
The result of the study shows a relatively low prevalence of hookworm infection (10.3%) with children aged 11-14yrs being the most infected. Walking barefooted, failure to deworming, sex, residence, and age being the significantly associated with the prevalence of hookworm among these children

Recommendation:
To prevent the spread of hookworm among children, all children should first be screened extensively for the intestinal parasite to know the infection rate, mass deworming should be done to reduce the infection and transmission rate and the local government should encourage the construction of toilet or else construct more toilets for the community.

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1 Background:

According to CDC 2019, Human hookworm disease is a common helminth infection worldwide the review done by Robyn Correll, (2020) about hookworm infection, showed that there are two primary ways people become infected with hookworms (Skin-to-soil: Hookworms live in soil contaminated with fecal matter and when humans walk

barefoot in the soil, the worm's larvae burrow their way through the foot and into the body or by ingestion when people defecate outside in the soil or use their stool as a fertilizer, hookworm eggs can contaminate food or water sources and be re-ingested or ingested by others). Because soil becomes infectious around 5-10 days after contamination and remains so for 3-4 weeks, depending on conditions

Hookworm is associated with clinical symptoms, such as abdominal pain, diarrhea, and protein malnutrition, commonly occurring. However, the principal clinical symptom of hookworm disease is iron deficiency anemia (IDA) because of blood losses Chronic IDA affects all ages, but it is principally deleterious to persons with low iron stores (children especially those below 14yrs and women of childbearing age). However, the sequelae of hookworm-associated chronic IDA include impaired physical and cognitive developments in children and raised perinatal maternal/infant mortalities in pregnant women (Huang, Y. *et al.,* 2019). Although most people with hookworm infections don't have any symptoms, those with long-term infections can experience lifelong issues as a result, especially children. Hookworm infection is still the major cause of mortality and morbidity among intestinal parasites.

In sub-Saharan Africa, the high prevalence of hookworm is mainly related to several determinant factors including poverty, poor living conditions, personal and environmental hygiene, sanitation, barefoot walking, and exposure to soil. Elfu Feleke B. (2018). Despite the strategies available in Uganda, data about hookworm among children is generally paucity although elsewhere from a study by (Ediau, M. et al., 2018) in Hoima, hookworm was the most common with a prevalence of 18.5%. Therefore this study also aimed at determining the prevalence of hookworm infection among children below fourteen years attending OPD at kome health center III in Mukono district.

2 Methodology

Study design

A cross-sectional study design was used since it's easy to use, economical, and describes the relevant aspects of the phenomenon of interest looking at a certain point in time and the study was laboratory-based seeking to determine the prevalence of hookworm infection among children below fourteen years attending OPD at kome health center III thus, was more effective in finding nature of the problem accurately

Study area

The study was conducted at kome health center III a government-based facility in Mukono District as per the WHO recommendation. The study area was considered because it's the most accessed health center on kome island thus a high number of children patients from Bugombe village – kome island and nearby vicinities attend the OPD daily thus approximately 80 children per day (extracted from OPD registers), making it a favorite in incidence availability. The study took three month (from 25th December 2021 to 25th April 2022)

Study population

The target population was children below fourteen years attending OPD at kome health center III daily with or without their caretakers

Sample size determination

The size of voluntary participants to be involved in the study was determined using the kiesh and Leslie (1965) method of sample size determination

Formula; N =Z2PQ

I2 where; N =sample size required

Z =is the constant normal standard variation corresponding to a 95% level of confidence (1.96)

P =is the probability of occurrence of the event (estimated prevalence of hookworm among children 18.5%) reported by **(Ediau, M. et al., 2018)** in Hoima - Uganda.

Q = 1-P therefore 1-p (1-0.185) = 0.815

I = desired level of precision at 10 % (0.01)

N=57.9

Therefore, 58 children were considered for the study to eliminate errors of bias from the study

Sampling technique

A stratified simple random technique was used. The technique was used because it's easy to use and it gives all children equal chances of participation

Sampling procedure

Here children were first stratified according to age (below 14 years) and a simple random technique was used to obtain the participants to be involved in the study. Children who presented with signs and symptoms or children and those who were asymptomatic but whose parents are willing to consent had equal chances to be selected as per convenient attendance time between 9 am to 5 pm daily until when the sample size was achieved

Data collection method

A quantitative data collection method was used; here data concerning prevalence was obtained through laboratory diagnosis of a stool sample. Processed as per the SOP of direct iodine wet preparation method. Results after review by the in-charge were analyzed and expressed into the prevalence of the event. Additional information was collected using a structured questionnaire.

Data collection tools

A well-structured questionnaire **(appendix I)** was given to the respondent takers who filled in their responses since the sample group is below the consenting age. It was read by the researcher while feeding the provided responses; the respondent form was used in data collection during the study. In addition tools/materials like glass slides, reagents, applicator sticks, iodine, coverslip, and stationeries like notebooks and pens were used during the process

Data collection procedure

After approval of the study by the institutional research committee, an introduction letter from the school seeking permission was given to me and presented to the in-charge of Kome health center III for authorization. After which a consent letter was presented to the participants' caretakers. The questionnaire will be provided to the participant's caretakers to obtain their credentials as needed by the study and for convenience, all questionnaires were filled in my presence in per to obtain the information needed, and guidance was provided where necessary. The final data concerning the prevalence of hookworm infection was obtained through laboratory diagnosis of stool samples

Study variables

The dependent variable was the prevalence of Hookworm infection

Independent variables were associated factors and age.

Quality control

Pilot study/ Pre-testing: Before conducting the study a designed tool, lab investigation forms, and sample logs were subjected to the supervisor and lab with aim of improving the tool, and where applicable changes were made.

SOPs: were followed for hookworm diagnosis to achieve the quality results and this was backed up by the quality Lab practices such as pre-analytical, analytical, and post-analytical stages of quality assurance.

Quality control procedures: standard coloured charts for reference were used to check the specificity of the test method and also internal controls were used to check the procedure and the data generated was reviewed by the professional Lab personnel to ensure accuracy before analysis and dissemination.

3 Data analysis and presentation

The data obtained was analyzed using computer Microsoft excel program and presented in form of proportions, tables, and figures

Ethical considerations

Approval to conduct this research was obtained from the research supervisor. An introductory letter was obtained from St.Francis school of Health Sciences, introducing the researcher and seeking permission to carry out the study from kome health center III. A letter of consent was filled fully by the voluntary participants' caretakers and total confidence was observed during the patient and results handling. In addition, other ethical codes such as privacy were applied and beneficence too if possible. Sample codes were used to avoid the display of patients' names to un authorized personals'.

Study Limitation

During the study the following limitation was faced; financial implications, limited time for data collection, inadequate literature about the study, and biased information from the participants

4 Results:

The study involved 58 participants and all of their parents consented to give a response rate of 100%.

Prevalence of Hookworm infection among children below 14 years

In the study, the sample size was 58 participants. Out of these, 6 /58 were infected giving a percentage of 10.3%, and remaining 52 children were not infected with Hookworm.

From figure 1 above, hookworm infection was detected in 6 children and 52 didn't have hookworm infection resulting in the prevalence of 10.7% and 89.3% respectively.

Associated risk factors of Hookworm infection among children below 14yrs

Wash hands before eating and after visiting the latrine

Table 1. Showing the frequency and percentage of hookworm infection among children below 14 years.

VARIABLE	FREQUENCY(n) Children with hookworm	Children without hookworm	To-tal	PERCENTAGE (%) Children with hookworm	Children without hookworm
Prevalence of hookworm infection	06	52	58	10.3	89.7

Source of data: Primary Data 2022

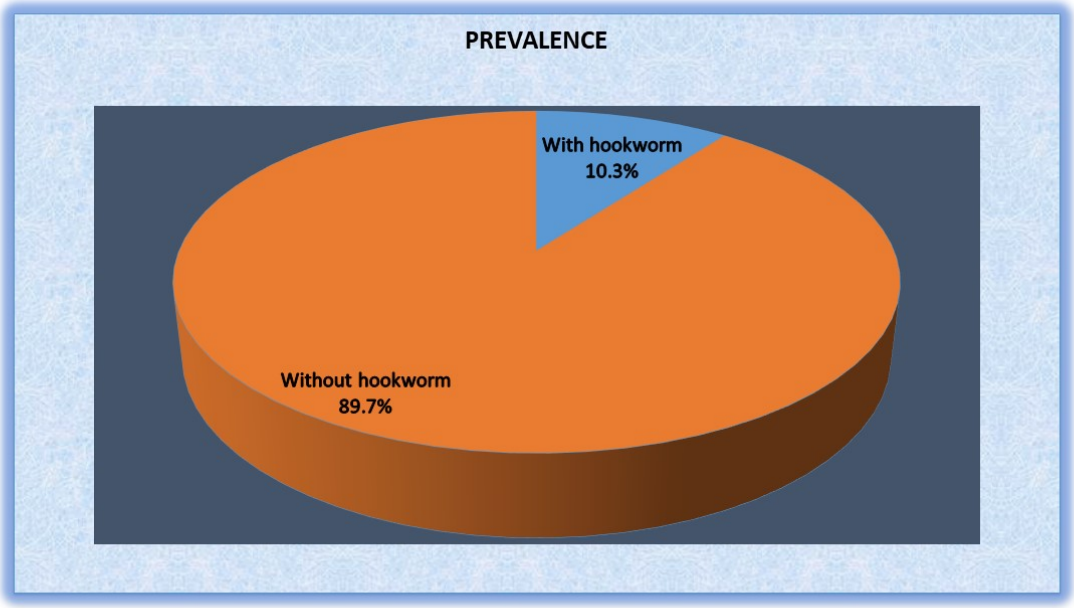

Figure 1. A pie chart showing the prevalence of hookworm infection

Table 2. Showing the frequency and percentage of hand washing

VARIABLE	FREQUENCY(N)			PERCENTAGE (%)	
	Yes	**No**	**Total**	**Yes**	**No**
Washing hands after visiting the latrine	18	40	58	31.0	69
Washing hands before eating	28	30	58	48.3	51.7

Source of data: Primary Data 2022

From the table above, only 18(31.0%) washed their hands after visiting the latrine and 40(69%) don't wash their hands after visiting the latrine. Not only do the most fail to wash their hands after going to the latrine but also 30(51.7%) don't wash their hands before eating with only 28(48.3%) of the children that do.

4.1

4.1.1 Residence:

All the participants enrolled in the study showed that Kome had no urban area as they all lived in a rural setting.

4.1.2 Usage of latrine

With the usage of latrines, the collected data in the table above still showed that only 20(34.5%) used

Table 3. Showing the residence of children.

VARIABLE	FREQUENCY(N)		
	Yes	**No**	**Total**
Rural	58	0	58

Source of data: Primary Data 2022

Table 4. Showing the usage of latrine

VARIABLE	FREQUENCY(N)			PERCENTAGE (%)	
	Yes	**No**	**Total**	**Yes**	**No**
Use latrine	20	38	58	34.5	65.5

Source of data: Primary Data 2022

them whereas 38(65.5%) don't use latrines for fecal management.

4.1.3 Walking bare-footed

The table showed that 43(74.1%) children walked barefooted while only 15(25.9%) had shoes.

De-worming

Only one child was de-wormed and the rest weren't as shown in the table above.

4.1.4 Sex

From the table above: females were 32/58 (55.2%) compared to males 26/58 (44.8%) Showing a cross-tabulation of hookworm infection and associated factors.

From the table below, females were less infected (2/6) than males 4/6.1/6 hookworm cases occurred in those who washed their hand after toilets and 5/6 occurred among those who didn't wash hands after using latrines. All 6 cases occurred in a rural area with those with poor usage of latrine having 5/6 cases and only 1 case for those who practiced hand washing. Additionally, walking barefooted resulted in 5/6 cases than putting on shoes (1/5) and only those who were dewormed were not infected and all cases occurred in those who were not dewormed.

4.2 To find out the most affected age

From the table 8 above; out of 6 overall cases of hookworm, most cases (4) occurred among children n between 11-14 years (66.7%) and at least one (1) case occurred among children ≤5yrs and 6-10(16.7%). Other 52 children didn't have hookworm infection and negativity was 31/52(59.6%), 2/52(3.8), and 19/52(36.5) respectively.

From figure 2 above: hookworm infection was most prevalent among children age range of 11-14(66.7%) and children ≤5 yrs. and 6 -10yrs had a prevalence of 16.7%

5 Discussion, Conclusion and Recommendation:

6 Discussion:

Prevalence of Hookworm infection among children below 14 years

The study showed a prevalence of hookworm infection of 10.3% among children below 14yrs and 89.7% were not infected. The prevalence was similar to that of a study that was carried out in rural areas of southern Thailand (Bunratsami S et al., 2018). This similarity may be because these studies were all carried out in rural settings with similar laboratory diagnostic methods.

Associated risk factors of Hookworm infection among children below 14yrs

From the study, children who washed their hands after visiting the latrine and before eating food (1/6 and 2/6) were less infected compared to those who didn't wash their hands after visiting the latrine and before eating were most infected (5/6 and 4/6) .this is because proper handwashing habits possibly reduced chance of being infected as well as breaking the transmission cycle. These results agree with those reported by (Bunratsami S *et al.,* 2018, and Ediau M *et al.,* 2018)

Table 5. Showing the waling bare-footed

VARIABLE	FREQUENCY(N)			PERCENTAGE (%)	
	Yes	**No**	**Total**	**Yes**	**No**
Walking bare footed	43	15	58	74.1	25.9

Source of data: Primary Data 2022

Table 6. Showing the de-worming among children

VARIABLE	FREQUENCY(N)			PERCENTAGE (%)	
	Yes	**No**	**Total**	**Yes**	**No**
De-worming	01	57	58	1.7	98.3

Source of data: Primary Data 2022

Table 7. Showing the sex

VARIABLE	FREQUENCY(N)			PERCENTAGE (%)	
	Female	Male	Total	Female	male
Sex	32	26	58	55.2	44.8

Source of data: Primary Data 2022

Table 8. Showing a cross-tabulation ofhookworm infection and associated factors

Variable	Response	Frequency N=58	Hookworm infection (n=6)
Washing hands after visiting the latrine	Yes No	18 40	1 5
Washing hands before eating	Yes No	28 30	2 4
Residence	Rural	58	6
Usage of latrine	Yes No	20 38	1 5
Walking bare footed	Yes No	43 15	5 1
De-worming	Yes No	1 57	0 6
Sex	Female Male	32 26	2 4

Table 9. Showing the cross tabulation of hookworm infection and most affected age

VARIABLE	FREQUENCY			PERCENTAGE	
Age	With Hookworm infection	Without hookworm infection	Total	With hookworm infection	Without hookworm infection
≤5	1	2	3	16.7	3.8
6-10	1	19	20	16.7	36.5
11 -14	4	31	35	66.7	59.6
Total	06	52	58	100	100

Source of data: Primary Data 2022

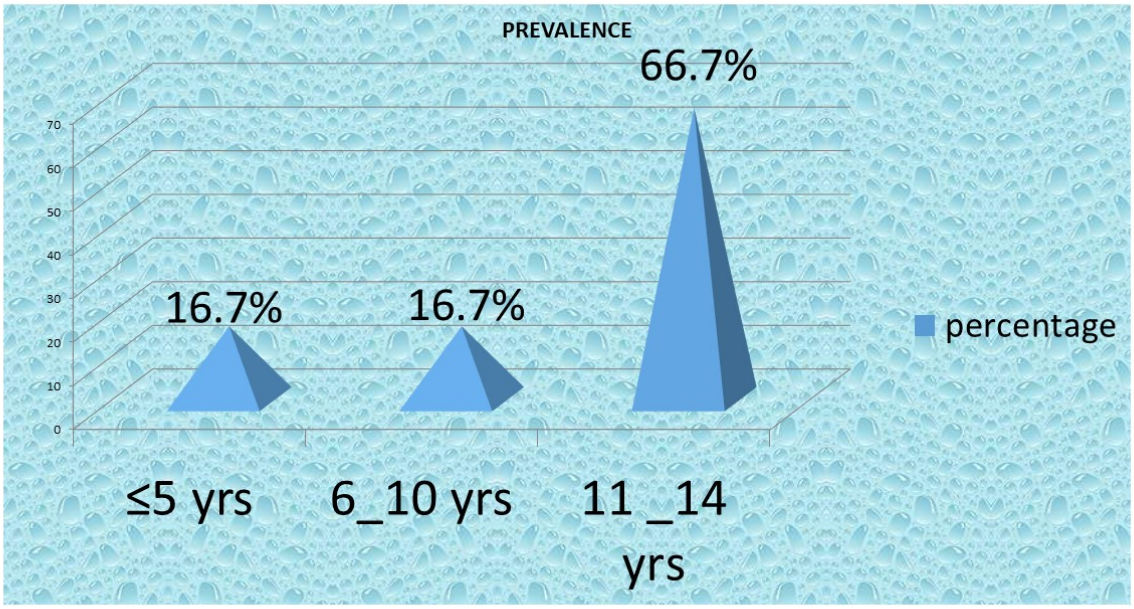

Figure 2. A cone graph presenting the prevalence of Hookworm infection in relation most affected age.

The study also revealed that children attending to OPD from rural areas had high odds of hookworm infection according to the reported case occurrence. This was because the kome health center is located in rural areas and there is no urbanized area on the island. The finding similar to the one which was reported by Elfu Feleke B. (2018) which revealed that hookworm is more prevalent among children in rural areas

The overall usage of the latrine was minimal, 38/58 used the latrine properly yet proper use of the latrine reduces the odds of infection. From the study, 5/6 cases occurred among those with poor usage compared to those with proper usage of latrines. This finding agrees with the finding reported by (Sentamu, K. *et al.,* 2015) in Uganda and (Hailu, T. *et al.,* 2019) in Ethiopia this is because the environmental chain of transmission is blocked when proper usage of latrines is practiced.

Those children who didn't walk barefooted had high odds of not being by hookworm than those who walked barefooted since the results indicated that 5/6 cases occurred among those without shoes. This is due to general weakness when it comes to the usage of shoes since didn't have children have shoes because some parents could not afford buying of shoes for regular use to an extent that some children reported that they even go to school without shoes. The findings were similar to those reported by (Hailu, T. *et al.,* 2019) in Ethiopia; who reported Children who did not wear shoes were 21.14 times more likely to be infected by hookworms.

Furthermore, failure to deworm children predisposed the children to hookworm infection. From the study findings, all children were not dewormed .this was because the information from the health center indicated that children were last dewormed about two years back. Thus increasing the odds of infection as was similarly reported in a study by (Ediau M *et al.,* 2018)

Regarding sex, it was found that females were more susceptible to hooking since about 32 of the children were female and only 26 were male. However males (4/6) were highly infected by hookworm compared to females (2/6).this is because of males. This is because males are active in

Finding out the most affected age

The objective aimed at finding out the most affected age and it was revealed that children aged 11-14 yrs. were the most affected age (4 cases of 6 overall) compared to those children aged ≤5 yrs. and those who were6-10 yrs. (only cases respectively). This is because children in age this age

group were all school going as well as having frequent contact with that contaminated areas. And the findings were similar to findings from a study by (Hailu, T. *et al.*, 2019) which was a high prevalence (16.7% among children aged 11-14yrs.

Conclusion

Generally, the aimed at determining the prevalence of hookworm infection and associated risk factors among children below 14yrs. the prevalence of hookworm was relatively high and Hookworm infection was significantly associated with wearing the shoe, hand washing practice, usage of latrine, deworming, residence, sex, or age. The prevalence of hookworm in rural areas was high with the male being high infected than females.

Additionally, the high prevalence of hookworm was possibly exaggerated by the presence of other intestinal parasites and increased mixed infections which were isolated during stool analysis of the stool sample but the results were not included due to the research topic interest

Therefore, there is a need for community mobilization, de-worming, health education on transmission, prevention, control measures, and associate risk factors of hookworm to reduce the burden of hookworm since if left the infection rate will increase from 10.3% to about 30% in just short period.

Recommandations

To prevent the spread of hookworm among children, it's recommended that all children should first be screened extensively for the intestinal parasite to know the infection rate

Mass deworming should be done as soon as possible to reduce the infection and transmission rate. The local government should encourage the construction of toilets or else construct more toilets for the community

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