Original article

Occurrence of Intestinal Parasites among Suspected Patients Attending Rubungo Health Center in Rwanda: Trend Analysis of Registry Records

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Abstract

Background
Intestinal parasitic infections are still a public health problem globally, affecting 3.5 billion people each year. This study aimed to assess the occurrence of intestinal parasites among suspected patients attending Rubungo Health Center in Rwanda.

Methods
This study used a quantitative retrospective cross-sectional design. A review of records on intestinal parasitic infections among both inpatients and outpatients who visited Rubungo Health Center between 2015 and 2019 was conducted. We used descriptive analysis and a chi-square test and logistic regression analysis to determine the significant factors associated with intestinal parasites.

Results
Out of 389 patients tested for intestinal parasites, 62.7% were positive. From 2015 to 2018, cases showed a declining trend, but there was a sharp increase in 2019 to 22.1% from 14.3% in 2018, a change that showed marginal statistical significance ($p = 0.054$). Males were 2.16 times more likely to have Entamoeba histolytica than females (AoR: 2.16, 95%:1.10-4.16). E. histolytica was the most common parasite, with fluctuating prevalence, peaking in 2016-2018 and reaching 14.8% in 2015 and 2019. Age categories showed a significant positive association with E. histolytica parasite.

Conclusion
This study highlights a high prevalence of intestinal parasites in the Rubungo Health Center catchment area. The persistence of these infections despite WASH interventions suggests inadequate implementation and a need to strengthen the continued health education in the community to all age groups.
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Keywords: Occurrence, Trends, Intestinal parasites, Rubungo Health Center

Background

Intestinal parasitic infections (IPI) are still a public health problem globally. IPI affects 3.5 billion people globally whereby more than 10.5 million estimated new cases are reported annually.[1,2] However, Intestinal parasitic infections are more prevalent in populations with low household income, poor practices, poor personal hygiene and environmental sanitation, overcrowded living conditions, and limited access to a safe water supply.[3] The most frequently reported intestinal parasites are Ascaris lumbricoides, Hookworms, Tricuris trichiura, Giardia lamblia, Entamoeba histolytica, and Schistosoma species.[4]

In Africa, more than 173 million people are infected with A. lumbricoides while 198 million and 162 million people are infected with Hookworms and Trichura trichiura respectively.[5] Intestinal parasitic infections affect the health status of an individual mainly in physical and mental development.[3,5] It leads to malnutrition, anemia, and retarded growth, depending upon the severity of the infection.[6,7] In Rwanda, six species of intestinal elements with an overall prevalence of 65.8% have been identified among school children aged 10-16 years old from 136 primary schools in 2008.[8] The predominant were A.lumbricoides38.8%, A.duodenalis 31.6%. Regarding those under five years old, 20% and 60.1% were infected by A. duodenal and A. lumbricoides respectively.[8] Moreover, various community-based and directed health interventions are being implemented intensively through Rwanda Ministry of Health, and the Ministry of Local Government. In addition to the community–based environment health promotion program (CBEHPP) launched in 2009, different public health campaigns, and deworming activities, the Ministry of Health through RBC validated the National strategic plan for NTD control including STHs in 2019.[9] One of the sustainable development goals of the United Nations (2030 Agenda; Goal 3.3) is to end, among others, the epidemics of NTDs through the control of the transmission of IPIs and the mitigation of possible risk factors.[10] It's in this context, that the Rwanda Ministry of Health adopted community-based programs to reduce hygiene-related diseases, and the 12th National Dialogue Council, resolution 14 recommended sensitizing all Rwandans to strive for healthy living with an emphasis on a balanced diet and proper hygiene with a hygiene and sanitation campaign conducted at the household level.[11]

A 2020 study conducted in Nyamasheke District reported a 53.2% prevalence of IPIs among children aged 12–59 months, with Ascaris lumbricoides at 13.1% and Entamoeba histolytica at 7.9%.[12] In 2024, a broader community-based survey found an overall IPI prevalence of 38.6%, where Entamoeba coli (21.3%) and Ascaris were most common.[13] Another 2024 study in Rutsiro District documented Ascaris in 28.5% and E. histolytica in 25.95% of under-two-year-old children.[14] These findings demonstrate that despite ongoing deworming initiatives, IPIs remain widespread. Moreover, intestinal parasites constitute a big part of medical consultations at the health center level including Rubungo Health Center.[15] Updating their epidemiological status helps to assess the effectiveness of the ongoing health interventions and develop effective prevention and control strategies is necessary.[7,16] Hence, this study aimed to assess the occurrence of intestinal parasites among suspected patients attending Rubungo Health Center in Rwanda among patients who were diagnosed with intestinal parasite infections from 2015 to 2019.

Methods

Study design and study population

The study used a quantitative retrospective cross-sectional design of the recorded intestinal parasitic infections for in and outpatients at Rubungo Health Center from 2015 to 2019. The study population was in and outpatients, both males and females of all age groups tested for intestinal parasitic infections from 2015 to 2019.

Study area

The study was conducted at Rubungo HC. It is the only HC located in Ndera Sector, Gasabo District, Kigali, Rwanda. This HC serves a population estimated at 38108 people. In addition to all 6 cells namely: Kibenga, Masoro, Cyaruzinge, Mukuyu, Rudashya, and Bwiza of the Ndera sector, its catchment area also comprises two cells of Bumbogo sector including Musave and Kinyaga cells means that Rubungo HC serves a population from 8 cells. Ndera sector comprises 41,764 population where males are 21,329 and females are 20,435. In addition, the Age groups are: 0-14 years are 15,975; 15-64 years are 24859, 65+years are 930(NISR,2016).

Sample size and sampling strategy

The population was sampled using Toro Yamane's formula[17] 1967.n= N:1+N (e)2. n: sample size N: population size e: precision or margin of error. N=15000 Patients, e= 0.05 n=15000:1+15000(0.05)2 where finally n=389. This formula was used because the study population was known and finite. In addition, we wanted to determine a representative sample with a specific level of precision as defined above. Systematic random sampling strategy as a probability sampling method was used, sampling fraction was determined as 15000/389 where an interval of 38 was obtained. SRS uses the (N/n) formula to get the interval ratio. In addition, to reduce the researcher's subjectivity, the study used a lottery approach to determine which patient to start among the first 38.

Inclusion criteria and Exclusion criteria

Patients with well-recorded social demographics (dates, age, sex, and location) and intestinal parasite information. While the recorded non-intestinal parasite findings (white blood cells, red blood cells, yeasts...) were not considered.

Data collection tools, procedures, and data quality

Data were collected by using an adapted data extraction form with all details being ones present in laboratory registry records. It was in that sense that, the medical records on intestinal parasites were reviewed from patients' registers in the laboratory and outpatient departments. The form was composed of the following sections: socio-demographic characteristics [Date, names (by codes), sex, age, and address] and diagnosed parasites data. The study used four trained enumerators and all were laboratory technicians with bachelor's Degrees. Principal investigators maintained the regular check of data being collected at the field daily where the all-data inconsistencies were given as feedback to the enumerators 24 hours before the next day. we used an open data kit (ODK) and the server was set in the investigator's computer to maximize close monitoring of submissions from the field.

Stool sample collection and examination

A total of 389 stool samples were collected for laboratory examination. Participants were supplied with appropriate plastic stool containers and fresh stools were collected. After stool collection, the samples were transported to be processed in the parasitological laboratory of the Health Center. Stool samples were kept in accordance with national laboratory standards and then examined using a direct smear process by biomedical lab technicians in the field. First, a physical examination of stool samples was carried out to assess for the following features: watery or bloody diarrhea and mucous in stool samples.

A drop of Normal saline was placed on a microscopic slide mixed with a piece of stool and covered by a cover slide. Direct microscopic examination for ova, cysts, and parasites was carried out by an experienced medical laboratory technician, and diagnosis was made based on morphology and size. Lastly, samples are taken and analyzed by Laboratory technicians who are licensed by the Rwanda Health Professional Council (RAHPC) and are regularly checked for capacity building related to laboratory techniques.

Data processing and analysis

Data were exported from the ODK server into MS Excel for preliminary data cleaning, then later were imported into Stata version 17 for final data cleaning and analysis. Quantitative variables were transformed into qualitative variables where applicable for better analysis. Univariate analysis was used to describe the proportion of prevalence, trends, and patterns of intestinal parasitic infection and quantified using statistical measurement including proportions and percentages. For qualitative variables of interest, during univariate analysis, we aimed to analyze and record measures of central tendency and dispersion including mean, standard deviation, Interquartile range, and mode. In addition, we performed a non-parametric test (chi-square test of independence to find out the association between selected predictors of intestinal parasitic infection where p-values and other relevant estimates were recorded. A p-value below 5% was considered to be significant. Lastly, a multivariable logistic regression was conducted to determine the odds ratio and 95% confidence interval of the significant variables.

Operational definition of variable(s)

During data capture from health facility records, the following variables were found:

- Year of patient consultation: This was recorded as the year in which the patient consulted a health facility for parasite laboratory testing.
- Age in years: It was recorded in categories whereby we had age in years <15, 15 to 35, and above 35 years old.
- Biological sex: It was recorded as male=0 and Female=1, just dichotomous variable
- Parasite detected: This was where we recorded the type of parasite seen during laboratory testing.

Ethical consideration

The ethical clearance was obtained from the College of Medicine and Health Sciences Institutional Review Board (IRB) with reference Number (CMHS/IRB/065/2020). And then permission to conduct research was requested and granted by Gasabo District. Anonymity of the data was considered by using a given code to the patient data. Data were kept in password-encrypted computers where only principal investigators and supervisors could access them.

Results

Social demographic characteristics

Table 1. Social demographic characteristics

Variable(s)	Frequency(n=389)	Percentage (%)
Age (median, IQR)	24(12,36)	
Age group (years)		
<=5	41	10.5
6 to 14	73	18.7
15 to 35	175	45
>35	100	25.7
Gender		
Male	154	39.6
Female	235	60.4
Sector(s) of origin		
Bumbogo	95	24.4
Ndera	294	75.6
Cell of origin		
Kinyaga	4	1
Musave	91	23.4
Kibenga	206	53
Bwiza	13	3.3
Masoro	23	5.9
Mukuyu	18	4.6
Rudashya	17	4.4
Cyaruzinge	17	4.4
Year of Visit		
2015	77	19.8
2016	81	20.8
2017	80	20.6
2018	73	18.8
2019	78	20.1

For Table 1: The study used a sample size of 389 patients, The Majority of patients were aged 15 years old and above 275(70.5%), Females were higher than males 235(60.4%), within two catchment areas of Rubungo health center coverage Ndera had many patients consulting for intestinal parasites tests 294(75.6%) and Kibenga cell showed higher predominance among other cells 206(53%). (See Table 1)

Parasites laboratory findings from 2015 to 2019

Results show that among 389 tested for parasites, 62.7% were tested positive and among them, Entamoeba histolytica was top most with 48.4% while the least was Trich. intestinalis parasite 15.6%. (See Figure 1)

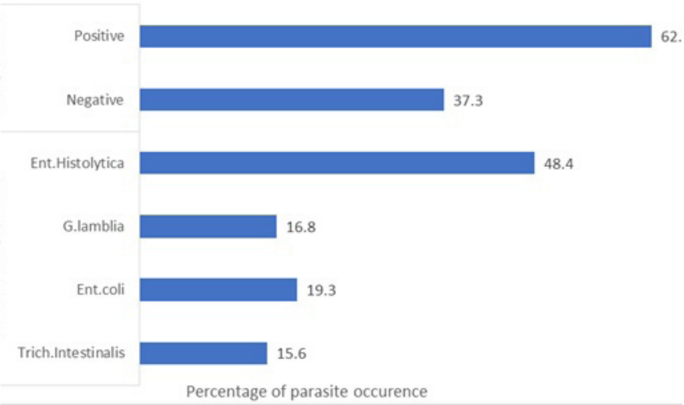

Figure 1. Showing parasites laboratory findings from 2015 to 2019

Trend of targeted intestinal parasite cases between 2015 and 2019

E. histolytica was higher in 2016 and 2017 30(54.5%) and 25(59.7%) respectively and lower in other years. While E. coli and Trich. intestinalis were higher in 2015 and 2019 at 14(24.1%) and 14(25.9%) respectively. Generally, the periodic prevalence of intestinal parasites fluctuation means that there was no consistency from a period of 2015 to 2019. These findings show no significant association at a p-value of 0.054. (Figure 2)

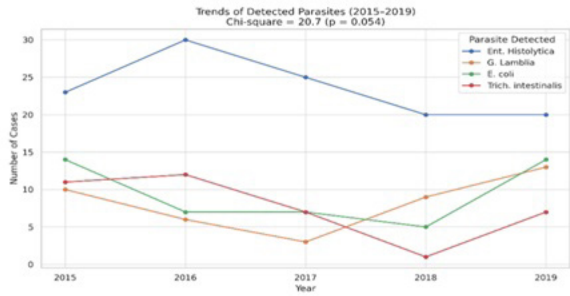

Figure 2. Trend of targeted intestinal parasite cases between 2015 and 2019

Factors associated with the occurrence of Intestinal parasites at Rubungo Health Center catchment area

Table 2. Bivariate analysis of the factors associated with the occurrence of Intestinal parasites in Rubungo Health Center catchment area

	Parasite n (%)				
Parasite(s) n (%)	**Ent.Histolytica**	**G. lamblia**	**E. coli**	**Trich.intestinalis**	**X^2(p-value)**
Age(in years)					15.9(0.068)
<=5	4(3.4)	7(17.1)	2(4.3)	3(7.9)	
6 to 14	20(16.9)	4(9.8)	7(14.9)	8(21.1)	
15 to 35	54(45.8)	22(53.7)	28(59.6)	18(47.4)	
>35	40(33.9)	8(19.5)	10(21.3)	9(23.7)	
sex					**10.6(0.014)**
Male	48(40.7)	23(56.10)	14(29.8)	9(23.7)	
Female	70(59.3)	18(43.90)	33(70.2)	29(76.3)	
Year of visit					20.7(0.054)
2015	23(19.5)	10(24.4)	14(29.8)	11(29)	
2016	30(25.4)	6(14.6)	7(14.8)	12(31.6)	
2017	25(21.2)	3(7.3)	7(14.8)	7(18.4)	
2018	20(17)	9(21.9)	5(11)	1(2.6)	
2019	20(17)	13(31.7)	14(29.8)	7(18.4)	
Sector					1.52(0.677)
Ndera	87(74.0)	34(83)	36(76.6)	28(74)	
Bumbogo	31(26.0)	7(17)	11(23.4)	10(26.3)	

The results show that Females were the most likely to have a higher occurrence of 75% of all parasite types seen. That is for E. histolytica 70(59.3%), E. coli (79.2%), and Trich. Intestinalis 29(76.3%). The above findings showed a significant association at a p-value of 0.014. (See Table 2)

The multivariable logistic regression analysis revealed that children aged 6–14 years had significantly higher odds of being infected with Entamoeba histolytica (AOR: 3.47; 95% CI: 1.08–11.12), and those aged 15–35 years also had increased odds (AOR: 3.34; 95% CI: 1.45–13.02) compared to children under 5 years, while individuals above 35 years showed the highest odds (AOR: 6.29; 95% CI: 2.05–19.26). Males were significantly more likely than females to be infected with E. histolytica (AOR: 2.16; 95% CI: 1.10–4.26). For other parasites (G. lamblia, E. coli, and Trichomonas intestinalis), no statistically significant associations were found across age, gender, or sector, though some variables showed elevated or reduced odds without statistical significance. (See Table 3)

Table 3. Multivariable logistic regression analysis of the factors associated with Intestinal parasites

Variables	E. histolytica	G. lamblia	E.coli	Trich. intestinalis
	AOR (95%CI)	AOR (95%CI)	AOR (95% CI)	AOR (95% CI)
Age in years				
<5	1.00	1.00	1.00	1.00
5-14	**3.47[1.08,11.12]***	0.31[0.08,1.16]	2.263[0.437, 11.71]	1.45[0.35, 6.07]
15-35	**3.34[1.45,13.02]***	0.85[0.32,2.25]	3.64[0.811 ,16.32]	1.233[0.33, 4.60]
>35	**6.29[2.05,19.26]***	0.46[0.15,1.44]	2.053[0.42 ,10.03]	0.93[0.23, 3.79]
Year				
2015	0.91[0.45,1.824]	3.75[0.97,14.47]	1.00	1.00
2016	1.41[0.72,2.77]	1.95[0.45,8.34]	2.65[0.99 ,7.10]	1.022[0.413,2.52]
2017	1.00	1.00	1.17[0.38 3.56]	0.512[0.18,1.42]
2018	0.95[0.46, 1.96]	2.87[0.720,11.44]	0.92 0.27 ,3.12]	0.086[0.11, 1.69]
2019	0.81[0.400, 1.64]	4.73[0.26,17.68]	2.62[0.98 ,7.008]	0.57[0.21, 1.59]
Gender				
Female	1.00	1.00	1.00	1.00
Male	**2.16[1.101,4.26]***	1.16[0.73,1.84]	1.59[0.80,3.14]	2.18[0.98,4.83]
Sector				
Ndera	1.00	1.00	1.00	1.00
Bumbogo	1.18[0.71,1.97]	0.59[0.24,1.38]	1.41[065,3.025]	0.98[0.45,2.18]

Discussion

Globally, about 24% of the world's population is infected with soil-transmitted helminth infections, and sub-Saharan Africa is highly affected by the infection.[18] This study aimed to assess at the occurrence of intestinal parasites among suspected patients attending Rubungo Health Center in Rwanda. The following results were in line with the study objectives: The most common Parasitic infection was E. histolytica, fluctuation appeared in trends of intestinal parasites throughout 2015 to 2019, and males showed a higher predominance of acquiring intestinal parasitic infections (Entamoeba Histolytica) than females and it was significantly associated. Lastly, Age groups showed a positive and significant association with Entamoeba histolytica.

The total sample of 389 patients examined stool samples were collected, classified and analyzed using Descriptive statistics, a non-parametric Chi-square test, and logistic regression. Among the examined samples, females were higher than males. The same results were reported in southern Thailand where females were more likely to have Intestinal Parasitic Infections than males [19] The opposite is true in the study done in western Northern Thailand.[20]

Findings showed that, in the past five years (2015-2019), *E. histolytica* was more prevalent followed by E. Coli. However, the same results were reported in the studies done in Ethiopia, and Vietnam where E. histolytica was the most prevalent.[21,22] It was then noted a slight decrease in cases of intestinal parasites during the period of the study (2015-2019) among the study participants. Positive cases of intestinal parasites decreased by 2.6% for *E. histolytica*, increased by 7.3% for G. lamblia, constant for E. coli, and decreased by 10.5% for Trich. These findings are consistent with other studies where trends of parasitic prevalence kept changing over time like a study conducted in southern Ethiopia.[23]

In 244 positive cases, the majority were in the age group of 15-35 years. That is different from the study done in southern Thailand where the prevalent age group was 41 – 50- years [20]and their mean age was 45 years old while this study's mean age was 26 years old.[22] Furthermore, the prevalence of targeted intestinal parasites increased with the age group for *E. histolytica* and *E. coli* while prevalence decreased with increasing age groups for *G. lamblia* and *Trich.intestinalis.*

Overall, E. histolytica and E. coli were more predominant in males than in females patients. The above findings showed a significant association of statistical tests in this study. The same results were reported in the study done in Palestine.[24] In addition,*G.lamblia* was predominant in male participants than female participants, whereas it was found to be more prevalent in males than females in the study done in Iraq.[25]

The observed trend in intestinal parasite cases at Rubungo Health Center between 2015 and 2019 shows a decline from 2015 to 2018 followed by a sharp rise in 2019. The initial decline may be linked to Rwanda's national deworming campaigns, improved access to safe water, and hygiene education under WASH initiatives, which contributed to reducing transmission.[26,27] However, the resurgence in 2019—from 14.3% to 22.1%—may reflect reduced intervention coverage, climate or environmental shifts, possible reinfection due to poor sanitation, or improved diagnostic practices leading to better detection.[28] It also raises concerns over sustained community-level behavior change and possible gaps in surveillance.

Study strengths and limitations

This study has both strengths and limitations. A key strength lies in the quality of data collection, which was conducted by trained personnel and allowed sufficient time for patient registry consultation, thereby enhancing data reliability. However, the study also possessed some limitations whereby registries contained a limited set of variables, which restricted the development of a comprehensive conceptual framework. Additionally, for patients with positive laboratory results, only one parasite was recorded per case, potentially underestimating co-infections and limiting the accuracy of parasite distribution analysis.

Conclusion

This study highlights a substantial burden of intestinal parasitic infections among suspected patients attending Rubungo Health Center, with a positivity rate of 62.7%. Although a decline was observed from 2015 to 2018, a sharp increase in 2019 indicates a potential resurgence that warrants attention. Young adults (15–35 years) and females were disproportionately affected, and *Entamoeba histolytica* emerged as the most prevalent parasite with fluctuating trends. These findings underscore the ongoing need for effective interventions.

This study provides a valuable contribution to understanding the burden of intestinal parasites in Rwanda and lays the groundwork for evidence-based public health actions.

Recommendations

To reduce the burden of intestinal parasitic infections, we recommend implementing targeted WASH (Water, Sanitation, and Hygiene) interventions such as promoting regular handwashing with soap, ensuring access to safe drinking water, improving household and community sanitation infrastructure, and conducting hygiene education campaigns. Enhanced surveillance systems, including routine screening and timely case reporting, should be established to monitor infection trends. Future research should focus on molecular identification of parasite species for precise diagnosis and explore underlying risk factors, including environmental and behavioral determinants, to guide tailored interventions. Strengthening laboratory capacity and integrating parasitic screening into broader community health programs will further support long-term control efforts. And also, it would be beneficial to evaluate the effectiveness of the reported WASH interventions that are in place.

Authors' contribution

This statement shows the authors' participation in the study: NR, IE, US, BC, and MU, study design, analysis, conceptualization, and Manuscript development, while UNJ, UD, NP, BC, and MR Manuscript review. Lastly, HM has mentored and supervised all steps performed in this study.

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Declaration of conflict of interest

The authors declare no conflict of interest with regard to this research and authorship of this article.

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