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Research Article

Prevalence, Distribution and Risk Factors of Helminths Parasite in Preschool Children in Rural Nomads Community in Abeokuta, Odeda Local Government Area, Ogun State

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ABSTRACT

Intestinal parasitosis poses a notable healthcare challenge, particularly in children from developing regions with warm and humid climates. This cross-sectional study, conducted from May to June 2024 among 64 primary school children in the Odeda nomads' community, focused on evaluating the occurrence of helminthic parasites and their contributing risk factors. Using a questionnaire, data on hygiene practices and gastrointestinal symptoms were collected. Stool samples were analysed through direct smear and formalin ethyl acetate concentration techniques. The sample consisted of 23 males (35.9%) and 41 females (64.1%). The findings revealed hygienic practices among those who washed hands once daily, 46.9%, thrice, 45.3%, and sometimes 7.8%. Children reported recent gastrointestinal symptoms 20.3%. The overall prevalence was 21.9%, with a higher infection in females (29.3%) compared to males (8.7%) [OR: 0.230; CI: 0.470-1.139]. There was a marginal significant difference in both sexes (P<0.056). Females aged 2-5 years had the highest prevalence (33.3%) compared to males (9.1%). Males who washed their hands thrice daily showed the lowest infection (0.0%) [OR: 0.080; CI: 0.005-1.396] compared to females (25.0%). The study identified 41 helminthic species distributions in females and 23 in males. Females had higher co-infections of (18) *A. lumbricoides* and *T. trichiura* while (5) in males, (12) *A. lumbricoides* and *H. worms* in females and (5) in males. Males had more co-infections with 13 *A. lumbricoides* and other species compared to 11 in females. These findings highlight the need for enhanced hygiene education and targeted interventions to mitigate helminthic infections in young children.

Keywords: Helminth Parasites; Distribution; Risk Factors; Preschool Children; Rural Nomads Community

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INTRODUCTION

Intestinal helminths parasite represent a notable healthcare challenge, developing and emerging economies, where they are a leading cause of contributing to illness and death in both humans and animals when left untreated (Jonathan *et al.,* 2023). Many of these infections, caused by helminths, are designated as Neglected Tropical Diseases (NTDs) by the World Health Organization (WHO, 2010; Hotez *et al.,* 2014). These diseases disproportionately affect impoverished communities, with millions of individuals in these areas suffering from the burden of these infections (Ojha *et al.,* 2014; Efstratiou *et al.,* 2017). Soil-transmitted helminths (STHs), including roundworms, whipworms, and hookworms, infect millions globally, with a significant concentration in developing regions of Asia, Africa, and Latin

America (WHO, 2010; Ross *et al.,* 2017; Hemandez *et al.,* 2019). The prevalent species affecting humans are *Ascaris lumbricoides* (roundworm), *Trichuris trichiura* (whipworm), and hookworms like *Necator americanus* and *Ancylostoma duodenale* (WHO, 2020).

Children, particularly those of preschool and school age, are at heightened risk of these parasitic infections. This vulnerability is largely due to their higher nutritional needs, underdeveloped immune systems, and the environments in which they live (Hotez *et al.,* 2014; WASH, 2016). The consequences of these infections are severe, including intestinal bleeding, nutrient mal-absorption, anaemia, intestinal obstruction, and delayed mental and physical development. These health issues lead to significant long-term impacts such as stunted growth, poor cognitive development, school absenteeism, low academic performance, and increased susceptibility to malnutrition and other infections (WHO, 2010; Tegen, 2020).

In addition to helminths infection, factors such as poverty, illiteracy, cultural practices, and inadequate awareness significantly contribute to the high prevalence of these diseases, especially among children (Sitotaw and Shiferaw, 2020; Gbebi *et al.,* 2018; deSilver *et al.,* 2003). This study seeks to evaluate the occurrence of helminthic parasites in preschool pupils from a rural nomadic community in Abeokuta and to develop effective control strategies.

MATERIALS AND METHODS

Descriptions of Study Areas

Malakun is a small community located in Odeda Local Government Area in Ogun State. It is primarily an agricultural area with a focus on crop farming and pastoral activities. The approximate coordinates of the rural community are 7.2120° N latitude and 3.3331° E longitude (GPIS). A cross-sectional study was carried out between May to June 2024 to evaluate the impact of intestinal helminthic parasite on preschool pupils from 2-15 years in Malakun nomads' community Odeda LGA, using simple random sampling method. Faecal samples from 64 Preschool pupils aged 2-15 years were randomly chosen and their samples were brought to the laboratory for examination. Using a semi-structured, pre-tested questionnaire, data on hygiene practices and gastrointestinal symptoms were collected. Stool samples were analysed through direct smear and formalin ethyl acetate concentration techniques to identify the presence of parasitic eggs, trophozoites, cysts, or relevant developmental stages of intestinal parasites. A survey was conducted to gather demographic information about the children.

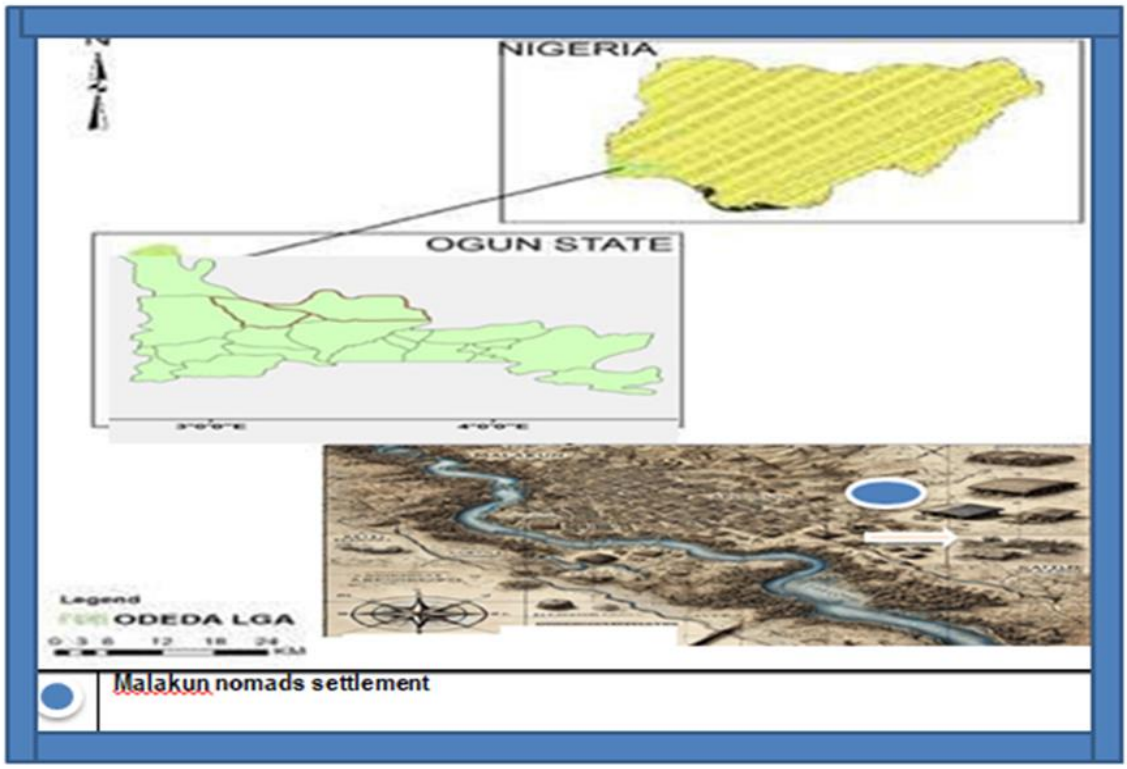


Figure 1: Map of the Study Area

Sample Collection

Fecal specimen

Every child was given a clean, dry, sealed, and properly labeled container for the collection of a fresh stool sample. The preschool children were guided on how to collect a small sample of their stool (approximately 5g) into the containers. During sample collection, details such as the date, participant's serial number, age, sex, and stool consistency were documented for each subject on a recording form. All stool samples were then transported to the Parasitology Laboratory at the Federal University of Agriculture, Abeokuta, for analysis and preserved in 10% formalin (Cheesbrough, 1987).

Data Analysis

The data generated were analysed using the Statistical Package for Social Sciences (SPSS) version 15 software. The data collected on the prevalence and intensity of helminth parasites were organised into categories and analysed through frequency tables and percentages. Chi-square analysis at a significance level of $P<0.05$ was used to assess the relationship between helminth parasite and variables such as age and sex.

Advocacy Visit and Ethical Consideration

Advocacy visits were made to the village head of the study area to solicit their support, during this process, the objectives and benefits of the research were explained to the members. The Research and Ethics Committee of the Ogun State Hospital, Ijaye, Abeokuta provided ethical clearance (reference number 2021/ SHA/NIS/NOIA/312) for this study. Only participants who gave their consent (written consent) were enrolled in the study.

RESULTS

Table 1 summarises the socio-demographic characteristics and hygiene practices of children used for the study. Out of the 64 children, 23 (35.9%) were males, while 41 (64.1%) were females, indicating a higher participation rate among females. The majority of the children, 38 (59.4%), were between the ages of 2-5 years. A smaller group, 11 (17.2%) were 6-11 years old, while, 15 (23.4%) were between ages 12-15. This shows a higher representation of younger children in the study.

In terms of hand washing, the result indicates that a majority practices regular hand washing, 30 (46.9%) children reported washing their hands with soap once a day, 29 (45.3%) washed their hands thrice a day, and 5 (7.8%) did so sometimes. When asked about recent gastrointestinal symptoms such as diarrhea, abdominal pain, or vomiting, 13 (20.3%) reported experiencing these symptoms, 22 (34.4%) had not experienced them, and 29 (45.3%) experienced them sometimes. Out of the total, 41 (64.1%) children had been tested for intestinal parasites or received treatment, while 23 (35.9%) had not. Regarding awareness of intestinal parasite infections, the results show a moderate level of awareness among the children; 31 (48.4%) children had heard of these infections, 12 (18.8%) had not, and 21 (32.8%) had sometimes heard about them. In terms of waste disposal practices, 30 (46.9%) children disposed of waste in streams and rivers, 29 (45.3%) disposed of it in the environment, and 5 (7.8%) used both methods (Table 1). This indicates a predominant use of environmentally harmful disposal methods among children.

The overall prevalence of gastro-intestinal helminths infections among the children was 21.9% (14/64), among the male participants, 2 (8.7%) tested positive [odds ratio (OR) 0.230; confidence interval (CI) of 0.47-1.139], while 12 (29.3%) female tested. The results indicated that males were less likely to be infected compared to females. This suggests that males had approximately 23% of the odds of infection compared to females in the study area. The chi-square (X^2) value of 3.649 with a P-value of 0.056 shows that there was a marginal statistical significance discrepancy in infection rates between males and females.

Table 3 details the prevalence of gastrointestinal helminth infections among different age groups and sexes in the study area. The overall prevalence among male children was 2(8.7%) and a female child was 12(29.3%). Among the male participants, 11 males aged 2-5 years showed a prevalence of 1(9.1%) testing positive while, in the 12-15 years age group, 1 (14.3%) tested positive. The lowest prevalence was recorded among the 6-11 years age group with 0(0.0%) in males. Among the female participants, 27 females aged 2-5 years showed a prevalence of 9(33.3%), testing positive. In the 6-11 years age group, 2 (33.3%) tested positive. In the 12-15 years age group, 1(12.5%) tested positive in females.

There was no statistically significant difference (P-value of 0.686). Overall, the data reveals a higher prevalence of infections among female children compared to male children, with the highest prevalence observed in the 2-5 years age group for females. However, these differences are not statistically significant, indicating that age does not play a significant role in the variation of infection rates within the studied population.

Table 1: Socio-demographic Profile of Children Included in the Study

Factor	Classification	Occurrence	Percent
Sex	Male	23	35.9
	Female	41	64.1
	Total	**64**	**100.0**
Ages	2-5years	38	59.4
	6-11years	11	17.2
	12-15years	15	23.4
	Total	**64**	**100.0**
How often do you wash your hands with soap?	Once	30	46.9
	Thrice	29	45.3
	Sometimes	5	7.8
	Total	**64**	**100.0**
Have you experienced GIT symptoms such as diarrhoea, abdominal pain, or vomiting recently?	Yes	13	20.3
	No	22	34.4
	Sometimes	29	45.3
	Total	**64**	**100.0**
Have you ever been tested for intestinal parasites or received any treatment?	Yes	41	64.1
	No	23	35.9
	Total	**64**	**100.0**
Have you heard of intestinal parasite infections before?	Yes	31	48.4
	No	12	18.8
	Sometimes	21	32.8
	Total	**64**	**100.0**
How do you dispose of waste or excreta?	Streams and Rivers	30	46.9
	Environment	29	45.3
	Both environment and water	5	7.8
	Total	**64**	**100.0**

Table 2: Occurrence of Helminth Parasite by Sex within the research Area

Sex	Number Examined	Number Negative	Number Positive	Old Ratio (OR)	Confidence Interval (CI)	X2	P-v
Male	23(100.0%)	21(91.3%)	2(8.7%)	0.230	0.47-1.139	3.649	0.056
Female	41(100.0%)	29(70.7%)	12(29.3%)	Reference	Reference		
Total	**64(100.0%)**	**50(78.1%)**	**14(21.9%)**				

Table 3: Occurrence of Helminth Parasite by Ages within the research Area

Sex	Ages Classification	Number Examined	Number Negative	Number Positive	X2	P-v
Male	2-5years old	11(100.0%)	10(90.9%)	1(9.1%)	0.754	0.686
	6-11years old	5(100.0%)	5(100.0%)	0(0.0%)		
	12-15years old	7(100.0%)	6(85.7%)	1(14.3%)		
Total		**23(100.0%)**	**21(91.3%)**	**2(8.7%)**		
Female	2-5years old	27(100.0%)	18(66.7%)	9(33.3%)		
	6-11years old	6(100.0%)	4(66.7%)	2(33.3%)	1.350	0.509
	12-15years old	8(100.0%)	7(87.5%)	1(12.5%)		
Total		**41(100.0%)**	**29(70.7%)**	**12(29.3%)**		
Overall Total		**64(100.0%)**	**50(78.1%)**	**14(21.9%)**		

Table 4 explores the prevalence of gastrointestinal helminthic infections based on the hygienic practices of children in the study area, categorised by sex. The total prevalence for those who washed their hands once was 8(26.7%), out of 30(100%) examined. Among males who washed their hands once, 6 were examined, 1 (16.7%) testing positive [(OR) 0.028; (CI) of 0.002-0.498], indicating a significantly lower likelihood of infection compared to the reference category for females, 7 (29.2%) testing positive. The chi-square (X^2) value was 0.384 with a P-value of 0.536, indicating no notable

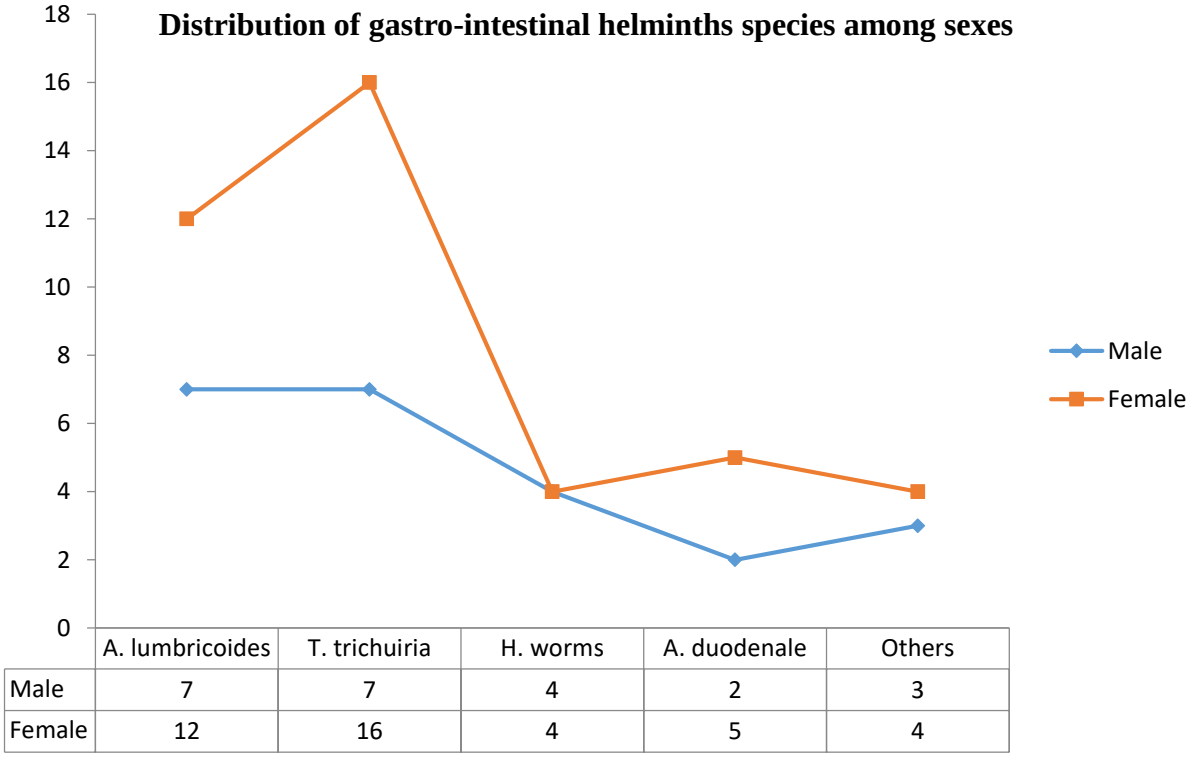
variation in infection levels between sexes that washed their hands once.

The total prevalence for those who washed their hands thrice was 4(13.8) of 29(100%) examined. Females had the highest prevalence, 4 (25.0%) testing positive. The least prevalence was recorded among males who washed their hands thrice with 0(0.0%), [(OR) 0.080; (CI) of 0.005-1.396], suggesting a lower likelihood of infection compared to the reference category. The chi-square (X^2) value was 3.770 with a P-value of 0.052 showing a notable statistically significant difference in infection rates between sexes that washed their hands three times.

The total prevalence for those who washed their hands sometimes was 2(40.0%) of 5(100%) examined. Among males who washed their hands sometimes, 1 (25.0%) tested positive [(OR) 4.016; (CI) of 1.514-10.655], females, 1(100.0%) tested positive. The females category served as the reference for odds ratio (OR) calculations. There was no statistically significant difference in infection levels between the sexes that washed their hands sometimes.

Table 4: Hygienic Practices and Prevalence of Helminths Infections among Sexes in the study Area

	Sex	Number Examined	Number Negative	Number Positive	Old Ratio (OR)	Confidence Interval (CI)	X^2	P-value
Once	Male	6(100.0%)	5(83.3%)	1(16.7%)	0.028	0.002-0.498	0.384	0.536
	Female	24(100.0%)	17(70.8%)	7(29.2%)	Reference	Reference		
	Total	**30(100.0%)**	**22(73.3%)**	**8(26.7%)**				
Trice	Male	13(100.0%)	13(100.0%)	0(0.0%)	0.080	0.005-1.396		
	Female	16(100.0%)	12(75.0%)	4(25.0%)	Reference	Reference	3.770	0.052
	Total	**29(100.0%)**	**25(86.2%)**	**4(13.8%)**				
Sometimes	Male	4(100.0%)	3(75.0%)	1(25.0%)	4.016	1.514-10.655	1.875	0.171
	Female	1(100.0%)	0(0.0%)	1(100.0%)	Reference	Reference		
	Total	**5(100.0%)**	**3(60.0%)**	**2(40.0%)**				
	Total	**64(100.0%)**	**50(78.1%)**	**14(21.9%)**				



	A. lumbricoides	T. trichuiria	H. worms	A. duodenale	Others
Male	7	7	4	2	3
Female	12	16	4	5	4

Figure 1: Distribution of gastro-intestinal helminths species among sexes in the study area

Keys: *A. lumbricoides* (*Ascaris Lumbricoides*); *T. trichiura* (*Trichuris trichiura*); Hook worms (H. worms); *A. duodenale* (*Ancylostoma duodenale*)

Figure 1 presents the distribution of gastro-intestinal helminths species among males and females children in the study area. Overall, the distribution of helminth species identified was 41 in

females and 23 in males (figure 1). Figure 2 presents the distribution of co-infections with gastro-intestinal helminths among male and female children in the study area. Sex specific variations were observed, with females showing higher co-infections of 18 *A. lumbricoides* and *T. trichiura* while 5 in males, 12 *A. lumbricoides* and *H. worms* in females, and 5 in males. Males had more co-infections with 13 *A. lumbricoides* and other species compared to 11 in females (figure 2). Whereas co-infections with *Ascaris lumbricoides* and *Trichuris trichiura* were the most common among female participants (Figure 2).

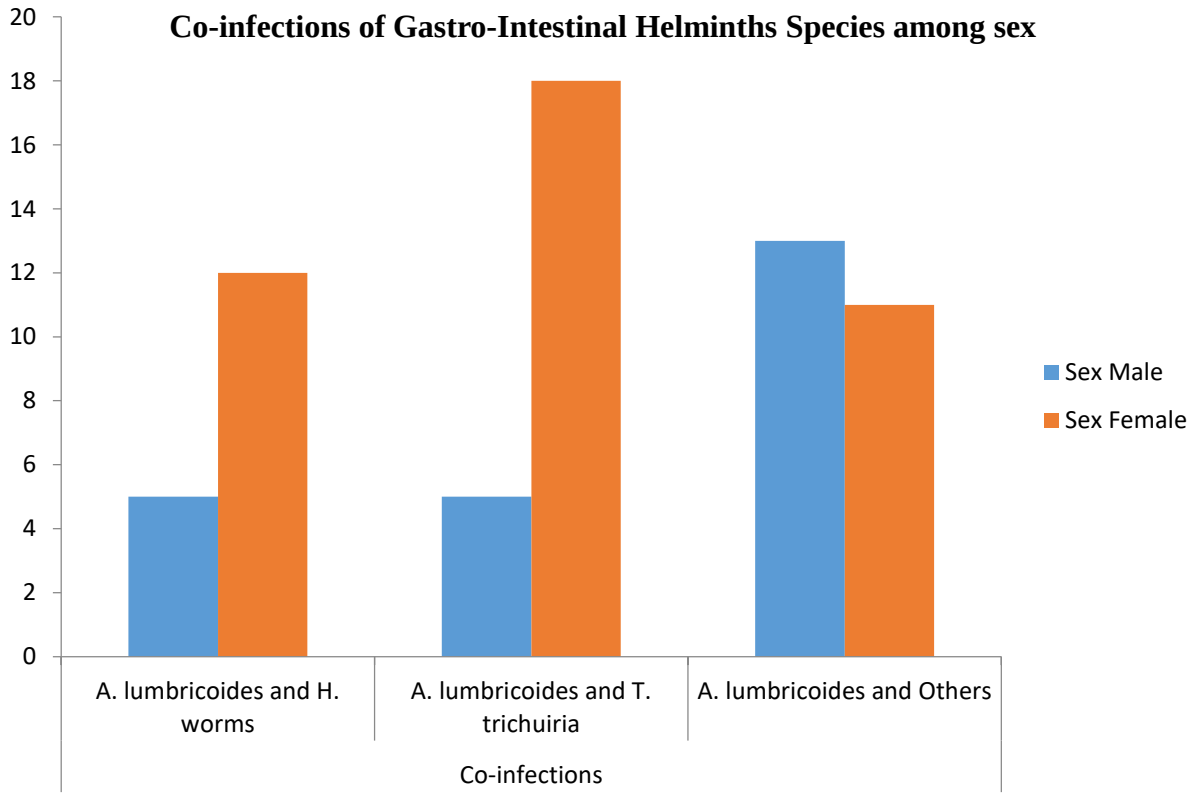


Figure 2: Sex and Co-infection with Gastro-Intestinal Helminths in the study Area
Keys: *A. lumbricoides* (*Ascaris Lumbricoides*); *T. trichiura* (*Trichuris trichiura*); Hook worms (H. worms); *A. duodenale* (*Ancylostoma duodenale*)

DISCUSSION

The study offers detailed insights into the socio-demographic characteristics, hygiene practices, and prevalence of gastrointestinal helminth infections among children in the study area. A notable finding was the higher participation of females (64.1%) compared to males (35.9%), with most children (59.4%) being aged 2-5 years. This age group is particularly susceptible to helminth infections due to their developing immune systems and greater exposure to contaminated environments, as noted by Hotez *et al*. (2014). Hygiene practices varied, with 46.9% of children washing their hands once daily and 45.3% washing three times daily. However, nearly half of the children (46.9%) disposed of waste in streams and rivers, reflecting poor sanitation practices that can facilitate helminthic transmission, as emphasized by Strunz *et al*. (2014). The study found an overall helminthic infection prevalence of 21.9%, with females showing a higher infection rate (29.3%) compared to males (8.7%). This sex disparity aligns with Brooker *et al*. (2006), who suggested that behavioral differences and exposure risks contribute to higher infection rates in females. Age and sex analysis revealed that the highest prevalence among males was in the 12-15 year age group (14.3%), while for females, it was in the 2-5 year age group (33.3%). However, no statistically significant differences were observed in infection rates across different age groups, a finding consistent with de Silva *et al*. (2003) who reported that age-related patterns of helminthic infections vary widely based on local environmental and socio-economic conditions.

In terms of hygiene practices and infection rates, children who washed their hands once a day had higher infection prevalence (26.7%) compared to those washing three times daily (13.8%). The highest prevalence (40.0%) was observed among children who washed their hands only occasionally, although this was not statistically significant. These findings align with Curtis and Cairncross (2003), who emphasised the importance of regular hand washing in reducing helminth infection risk. The most prevalent helminth species identified were *Trichuris trichiura* (35.9%) and *Ascaris lumbricoides* (29.7%). Males showed higher infections of *Trichuris trichiura* and *Ascaris lumbricoides* (30.4% each), while females had a higher prevalence of *Trichuris trichiura* (39.0%). These distributions are consistent with global patterns reported by Pullan and Brooker (2012), highlighting the widespread nature of these infections. Co-infections were also common, with *Ascaris lumbricoides* and other species showing the highest rates (37.5%). The prevalence of co-infections underscores the complexity of helminthic epidemiology, as emphasised by Steinmann *et al*. (2010), who pointed out that co-infections can worsen health outcomes and complicate treatment efforts. Improved hygiene practices and better waste disposal methods are essential to reduce infection rates, aligning with (Bethony *et al.,* 2006) on the need for integrated control measures, including sanitation, hygiene education, and regular deworming programs.

CONCLUSION

The study highlights several critical findings regarding the occurrences of helminth parasites in children within the study area. Notably, female children exhibited a higher prevalence of infections compared to male children, indicating potential sex-specific vulnerabilities. Younger children, particularly those aged 2-5 years, were more susceptible to infections, emphasising the need for early-age interventions.

Hygiene practices, especially the frequency of hand washing, played a significant role in infection rates. Children who practiced regular hand washing had lower infection rates, suggesting that improved hygiene can be an effective preventive measure. The study also identified *Trichuris trichiuria* and *Ascaris lumbricoides* as the most prevalent helminth species, with frequent co-infections among the children more especially aged group 2-5 years.

This disparity suggested that behavioural differences among ages are risk factors contributing to higher infection rates in the study area.

Authors Contributions

JJ conceived the idea for this study and designed the study; JJ, NVC and OQE participated in the fieldwork and data collection. JJ performed the statistical analyses. JJ, PVG, and OQE interpreted data. JJ prepared the first draft of the manuscript, which was reviewed by the PVG, NAJ and WBE. All the authors contributed to the development of the final manuscript and approved its submission.

Competing interests

The authors declare that they have no conflicts of interest.

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