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Prevalence and Risk Factors Associated with Some Intestinal Parasitic Infections among School Children in Yenagoa Metropolis, Bayelsa State, Nigeria

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Abstract

Intestinal parasite infections (IPIs) remain a major public health problem among school-aged children in Nigeria, with differing school environments and socio-economic conditions potentially shaping transmission dynamics. This study investigated the prevalence of IPIs and associated risk factors among children attending public and private primary schools in Yenagoa Metropolis, Bayelsa State, and compared prevalence patterns between these settings. A cross-sectional descriptive design was employed, and a total of 395 stool samples were collected from pupils in 10 primary schools (5 public and 5 private). Stool specimens were examined using direct wet mount and formal ether concentration techniques, while socio-demographic and risk-factor data were obtained through structured questionnaires. Associations between infection status and socio-economic variables were assessed using chi-square tests. The overall prevalence of IPIs was 23.8%, with slightly higher prevalence in public schools (25.7%) than in private schools (21.8%). The most frequently

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identified helminths were *Ascaris lumbricoides*, *Trichuris trichiura*, and *Strongyloides stercoralis*, while *Entamoeba histolytica* and *Giardia lamblia* were the predominant protozoa. Infection was most common among children aged 8–10 years (26.6%), and female pupils aged 11–13 years in public schools showed relatively higher infection rates, although no statistically significant differences were detected across age categories or between genders within and across school types. The findings underscore a moderate overall prevalence of intestinal parasites and highlight the continued vulnerability of primary school children to both helminthic and protozoan infections. The study concludes that improving hygiene practices, sanitation infrastructure, and access to clean water in both public and private school communities is essential to reduce transmission and protect child health in Yenagoa Metropolis.

Keywords: Intestinal Parasite Infections; Primary School Children; Prevalence; Risk Factors; Yenagoa, Nigeria.

INTRODUCTION

Intestinal parasitic infections (IPIs) occur when several parasites are present in the gastrointestinal tract of humans (Arosoye et al., 2018; Dudlová et al., 2016; Funso-Aina et al., 2020). According to Arosoye et al. (2018) these parasites might potentially belong to either the category of protozoa or helminths (worms). The three most common intestinal protozoan parasites are *E. histolytica*, *G. lamblia,* and *Cryptosporidium spp*. (Dagne & Alelign, 2021; Hemphill et al., 2019). These intestinal protozoan parasites are mostly characterised by diarrhoea (Dagne & Alelign, 2021; Di Genova & Tonelli, 2016; Hemphill et al., 2019). The three common forms of helminths are flukes (trematodes), tapeworms (cestodes), and roundworms (nematodes) (Mitre & Klion, 2021). Upon entering the human body, these worms may induce a parasitic infection, manifesting as intestinal worms (Varyani et al., 2017). Infections are widespread in many places around the globe, particularly in underdeveloped areas with inadequate sanitation and limited availability of clean water (Duguma et al., 2023; Kantzanou et al., 2021; Usip et al., 2023). Intestinal parasite infections remain a notable public health issue, especially affecting children in underdeveloped nations.

These infections pose a significant risk to the health and welfare of children, impacting their physical and mental development as well as their general well-being. The occurrence of intestinal parasite infections differs across locations, with elevated rates

found in places characterised by substandard sanitation, restricted availability of uncontaminated water, and insufficient healthcare infrastructure. Children are more susceptible to harm because of their underdeveloped immune systems and behaviours that increase their exposure to polluted settings (Fauziah et al., 2022). Approximately 24% of the world's population is afflicted with soil-transmitted helminth infections. This includes more than 260 million children of preschool age and over 600 million children of school age who reside in places where these illnesses are widespread (WHO, 2023). In many regions of sub-Saharan Africa (SSA), the prevalence of intestinal parasite infection exceeds 50% (WHO, 2023). In addition, approximately 600 million individuals worldwide are believed to be affected by *S. stercoralis*. However, because of its transmission in regions with inadequate sanitation, its geographic distribution coincides with that of other soil-transmitted helminthiases. The projected prevalence rate of intestinal parasitic infections (IPI) in children in African nations, namely southern Nigeria, is 23.95% (Gbonhinbor et al., 2022). *Ascaris lumbricoides, hookworm*, and *Trichuris trichiura* are the primary causes of most illnesses (Gbonhinbor et al., 2022). In sub-Saharan Africa, *E. histolytica, Strongyloides stercorals, G. lamblia, Schistosoma mansoni, Diphyllobotium latium*, and *Fasciola hepatica* are the protozoan infections that children younger than 5 years old get the most of (Gbonhinbor et al., 2022; Mekonnen, 2019; WHO, 2023). There are notable apprehensions about the possible immediate and long-lasting problems of IPI in children (Koruk et al., 2010; WHO, 2023).

Intestinal parasitic infections (IPIs) may lead to impaired nutrient absorption and persistent blood loss, resulting in lasting impacts on the physical and cognitive development of children (Jourdan et al., 2018; Pullan et al., 2014). Malnutrition, particularly in disadvantaged groups, increases the susceptibility of children to intestinal parasitic infections (IPI). This, in turn, may lead to protein-energy malnutrition, iron-deficiency anaemia, and consequent impairments in both mental and physical development (Jourdan et al., 2018). Intestinal parasitic infections reside in the gastrointestinal tract (GIT), which is responsible for digesting and absorbing nutrients. As a result, these infections can lead to a decrease in food intake and/or an increase in nutrient wastage due to blood loss, vomiting, inflammation-induced impairment of digestion and absorption, or diarrhoea. Therefore, these consequences may result in or worsen protein-energy malnutrition, anaemia, and other deficiencies in nutrients (Lwanga et al., 2012; Yoseph & Beyene, 2020).

As a result, the World Health Organisation (WHO) recommends administering deworming treatment once a year in regions where the prevalence rate of soil-transmitted

helminthiases ranges from 20% to 50%. In areas with prevalence rates exceeding 50%, treatment should be given twice a year, without requiring an individual diagnosis, to all individuals at risk who reside in endemic areas (Yoseph & Beyene, 2020). This technique reduces morbidity by decreasing the number of worms present. In addition, health and hygiene education may reduce the spread and recurrence of infections by promoting healthy behaviours. However, ensuring access to adequate sanitation is crucial, although it may not always be feasible in areas with inadequate resources (WHO, 2020). In 2016, there was a global objective to eradicate the occurrence of illness and death caused by intestinal parasite infections in preschool and school-aged children by the year 2020 (WHO, 2016). However, this has not been achieved. This is partly because the intestinal parasites are persistent, and many developing countries are yet to provide basic amenities for the majority of their people.

Therefore, predisposing the majority of children to these infections. Other factors include inadequate sanitation, unsanitary behaviours, a lack of drinkable water, substandard living conditions, and poverty (Abah & Arene, 2015; Tegen & Damtie, 2021). Intestinal parasitic infections are common in socio-economically disadvantaged communities where poor environmental sanitation, overcrowding, a lack of access to safe and clean water, and low levels of education are prevalent. These conditions contribute to the high prevalence of infections. The consequences of these infections include a perpetual cycle of poverty. Soil-transmitted helminths are consistently recognised as a prevalent public health issue and the most prevalent among intestinal parasitic infections (IPIs) owing to regular exposure to soil during everyday activities (WHO, 2023). The prevalence of infections caused by hookworm (Necator americanus and Ancylostoma duodenale), A. lumbricoides, and Trichuris trichiura is highest among the most impoverished individuals worldwide (Dagne & Alelign, 2021; Di Genova & Tonelli, 2016; Hemphill et al., 2019; WHO, 2023).

Intestine parasites are known to attach to fingers, fruits, vegetables, instruments, door knobs, and even money. Although, flies may also transfer them. Nevertheless, their attachment to fingernails is a prominent cause of infection. Therefore, the detection of intestinal parasites in the fingernails serves as evidence of one of the pathways by which the parasite might be transmitted. It also suggests the existence of an ongoing infection or a potential source of parasitic infection. Additionally, it serves as a sign of inadequate personal cleanliness, often seen among children living in rural regions. As a result, children may easily spread infections to the greater community by sharing school equipment, playing

together, and by self-infection by biting and sucking their fingers, which is typical among children of this age (Usip et al., 2022). These infections have been linked to a higher likelihood of nutritional anaemias, protein-energy malnutrition, and growth deficiencies in children (Arosoye et al., 2018; Funso-Aina et al., 2020).

Thus, the ongoing prevalence of intestinal parasite infections in children may be attributed to many environmental and socio-economic variables. Given the adverse socio-economic consequences of these parasitic illnesses in children, it is imperative to develop effective prevention and control strategies that may be easily implemented in tropical regions. In order to do this successfully, it is necessary to consistently collect fundamental data on the prevalence of parasitic illnesses in various regions. Against this background, the study is proposed to assess the prevalence of intestinal parasite infections (IPIs) and identify the risk factors for transmission among children attending public and private primary schools in Yenagoa Metropolis, Bayelsa State.

MATERIALS AND METHODS

Study Area

The investigation will be conducted in Yenagoa, Bayelsa State, Nigeria. Bayelsa State was created from a portion of Rivers State in 1996 and is one of the six states in the South-South geopolitical zone. It borders Rivers State to the west and northwest, Delta State to the east and southeast, and the Gulf of Guinea to the south. The state covers about 9,415.8 km², located at latitude 4°45' N and longitude 6°05' E. In 2006 the population was 1,704,515, giving a density of 158 persons/km² (≈1.2 % of Nigeria's total population). Yenagoa is characterized by tropical rainforest and mangrove wetlands. Historically, fishing was a major economic activity, but oil exploration has degraded the environment. Agriculture (yams, cassava, plantains, oil palms, bananas) and activities such as palm-oil processing, logging, palm-wine extraction, local alcohol production, commerce, carving, and weaving are also important. The predominant ethnic group is the Ijaw, speaking dialects such as Tamu, Mein, Jobu, Oyariri, and Tarakiri. Settlements are "floating" villages and towns, with the highest population concentration in Southern Ijaw (23.8 %), followed by Yenagoa (9.3 %) and Kolokuma/Opukuma LGA (6.0 %). Yenagoa's capital hosts two major public hospitals—Federal Medical Centre (FMC) and Diete Koki Memorial Hospital, Opolo. Numerous private clinics exist, but most residents cannot afford them due to high

costs and limited transport. Water sources include rivers, canals, piped water, the Niger River, dry riverbeds, seasonal streams, and open wells.

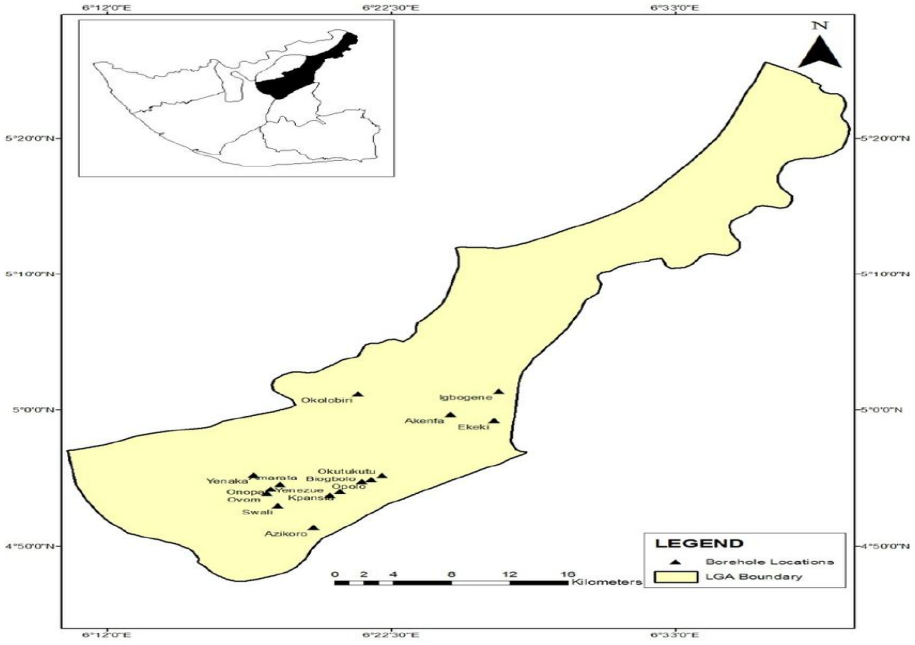


Figure 1: Map of the Study Area

Adapted from Nwankwoala et al., (2014)

Study Design

A cross-sectional descriptive study will be conducted using one-time sampling of public primary-school children. Ten schools (5 public, 5 private) will be selected across Yenagoa Metropolis.

Study Population

Primary-school children (aged 8-15 years, classes 3-8) from the selected schools. Each ward forms a stratum; balloting will choose schools per ward. A class list will be obtained from each head teacher and ages verified with parents during consent.

Inclusion Criteria

Children aged 8-15 years in classes 3-8 whose parents give written consent.

Exclusion Criteria

Children whose parents do not consent, those outside the age range 8-15 years, and pupils below class 3.

Sampling Technique

Stratified sampling by ward, followed by systematic sampling of pupils per class using the class register. Sampling interval = class population ÷ required sample size.

Sample Size Determination

Sample size was determined by use of the following formula:

$$n = \frac{Z^2pq}{d^2}$$ (Mugenda and Mugenda, 2003).

Where p = estimated prevalence of intestinal parasitic infections in the study area.

0.5 because IPI prevalence in Mbeere North is not known.

q = 1-p, d = level of statistical significance (0.05)

Z= standard normal deviation which corresponds to 95% confidence interval (1.96)

$$n = \frac{1.962 \times 0.5 \times 0.5}{0.052} = 385 \text{ pupils.}$$

Therefore, the sample size was raised to 414 pupils to cater for eventualities such as failure to sign informed consent form and data loss.

Number of pupils per school was 414/10 = 41.4 = 410

41 participants per school

Number of pupils per class = 41/6 = approx. = 7 persons per class.

Data Collection

Questionnaire: pre-tested, administered in the local language; includes demographic, socioeconomic and behavioural variables; fingernail inspection during interview.

Stool samples: children instructed to provide clean, labelled specimens in leak-proof containers with applicator sticks. Samples stored in 10 % formalin and transported to the Microbiology & Parasitology Laboratory, Department of Animal and Environmental Biology, Niger Delta University.

Laboratory Analysis

1. Microscopy (saline & iodine): direct smear examined at ×10 and ×40 for helminth eggs and protozoan trophozoites.

2. Formol-ether concentration: 1 g stool mixed with saline + 10 % formalin, filtered, ether added, centrifuged (3000 rpm, 1 min). Sediment examined microscopically.

Parasites identified using pictorial keys (Arora & Arora, 2010; Jeffrey & Leach, 2001).

Data Analysis

Prevalence calculated with descriptive statistics; chi-square test for associations. \(p < 0.05\) considered significant. SPSS v.18 used; mean, SD and CV reported. Results presented in tables and figures.

Ethical Considerations

Ethical clearance obtained from the Department of Public Health, State Ministry of Health, and State Primary Schools Board. Written informed consent secured from parents/guardians and school heads. Participation is voluntary, with the right to withdraw at any time and no penalties or incentives.

RESULTS

Samples were collected from 10 schools (A-J) yielding 395 participants: 202 from public schools and 193 from private schools (see Tables 1-10 and Figures 1-2).

Prevalence in Public Schools

- Overall IPIs: 25.7 % (52/202).

- Helminths: A. lumbricoides 10 (4.95 %), T. trichiura 5 (2.48 %), S. stercoralis_ 2 (0.99 %), others 7 (3.47 %).

- Protozoa: E. histolytica 10 (4.95 %), G. lamblia 7 (3.47 %).

- Age-specific prevalence: 8-10 yr 26.6 %, 11-13 yr 26.8 %, 14-15 yr 23.2 %.

- Gender: females 31 (29.0 %), males 21 (22.1 %).

- No significant differences by age or sex ($p > 0.05$).

Prevalence in Private Schools

- Overall IPIs: 21.8 % (42/193).

- Helminths: A. lumbricoides 8 (4.15 %), T. trichiura_ 4 (2.07 %), S. stercoralis 2 (1.07 %), others 5 (2.59 %).

- Protozoa: E. histolytica 9 (4.66 %), G. lamblia 4 (2.07 %), other protozoa 6 (3.11 %).

- Age-specific prevalence: 8-10 yr 25.7 %, 11-13 yr 19.7 %, 14-15 yr 19.4 %.

- Gender: females 24 (21.6 %), males 18 (22.0 %).

- No significant differences by age or sex ($p > 0.05$).

Comparative Analysis

No statistically significant differences ($p > 0.05$) were found between public vs. private schools, age groups, or genders.

Table 1: Number of Participants admitted in each school

Schools	Total number of participants examined	Percentage (%)
School-A	40	10.13
School-B	38	9.62
School-C	40	10.13
School-D	39	9.87
School-E	40	10.13
School-F	38	9.62
School-G	40	10.13
School-H	41	10.38
School-I	41	10.38
School-J	38	9.62
Total	395	100

N=395

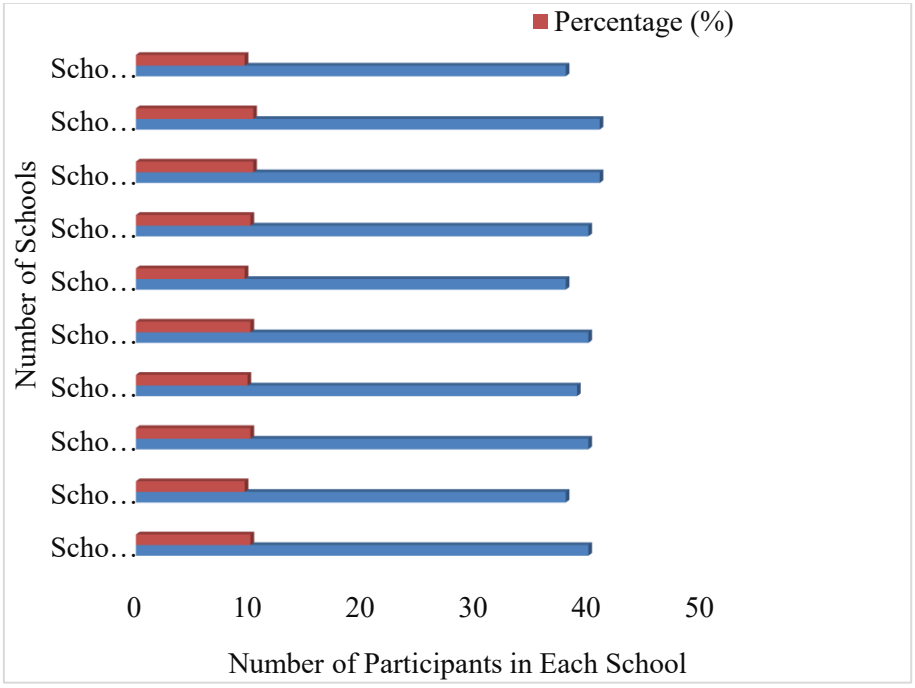


Figure 1: Participants from Public and Private Schools

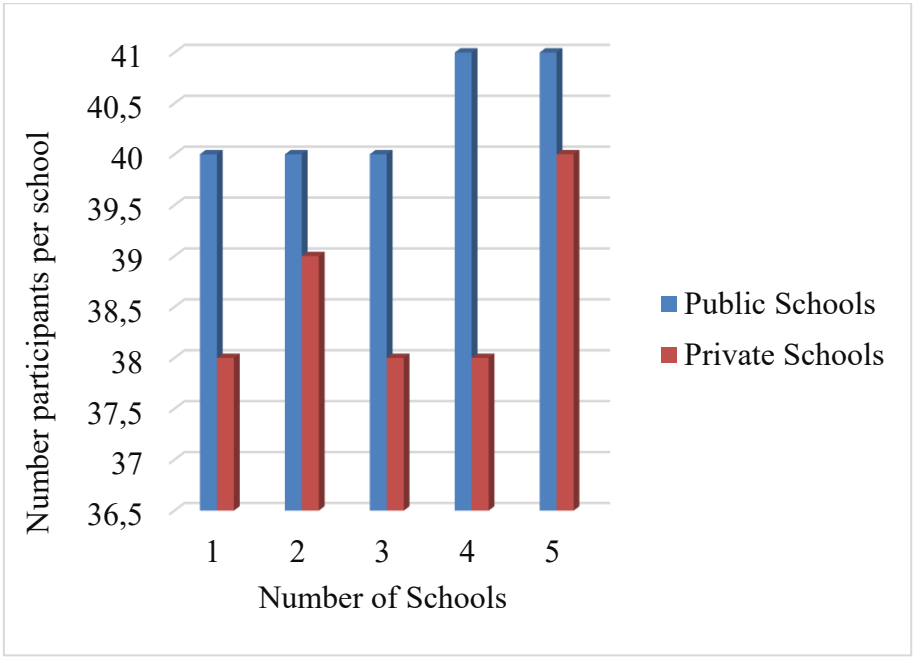


Figure 2: Participants from Public and Private Schools

Table 2: Prevalence of Intestinal Parasite Infections (IPIs) in Public Schools

Schools	Total number of participants examined	Total number of participants infected (*f*)	Prevalence (%)
School-A	40	10	25.0
School-B	40	12	30.0
School-C	40	11	28.0
School-D	41	10	24.0
School-E	41	9	22.0
Total	202	52	25.7

N=202

Table 3: Prevalence of Intestinal Parasite Infections (IPIs) in Private Schools

Schools	Total number of participants examined	Total number of participants infected (*f*)	Prevalence (%)
School-A	38	8	21.0
School-B	39	9	23.0
School-C	38	8	21.0
School-D	38	9	16.0
School-E	40	8	20.0
Total	193	42	21.8

N=193

Table 4: Prevalence of Intestinal Parasite Infections (IPIs) in Public Schools

Schools	No. examined	No. infected (f)	Prevalence	Helminthes						
				A.lumbricoides	T.trichiura	S.stercoralis	Others	E. histolytica	G. lamblia	Others
School-A	40	10	25.0	3 (7.5%)	1(2.5%)	0(0.0%)	2(5.0%)	2(5.0%)	0(0.0%)	1 (2.5%)
School-B	40	12	30.0	2(5.0%)	1(2.5%)	1(2.5%)	2(5.0%)	2(5.0%)	2(5.0%)	2(5.0%)
School-C	40	11	28.0	2(5.0%)	1(2.5%)	0(0.0%)	1(2.5%)	2(5.0%)	2(5.0%)	2(5.0%)

School-D	41	10	24.0	2(4.88%)	1(2.44%)	0(0.0%)	1(2.44%)	2(2.88%)	2(4.88%)	2(2.88%)
School-E	41	9	22.0	1(2.44%)	1(2.44%)	1(2.44%)	1(2.44%)	2(2.88%)	1(2.44%)	1(2.44%)
Total	202	52	25.7	10 (4.95%)	5(2.48%)	2(0.99%)	7(3.47%)	10(4.95%)	7(3.47%)	8(3.96%)

N=202

Table 5: Prevalence of Intestinal Parasite Infections (IPIs) in Private Schools

Schools	**No. examined**	**No. infected (*f*)**	**Prevalence**	**Helminthes**						
				A.lumbricoides	*T.trichiura*	*S.stercoralis*	Others	*E. histolytica*	*G. lamblia*	Others
School-A	38	8	21.0	2 (5.3%)	1(2.6%)	0(0.0%)	1(2.6%)	2(5.3%)	0(0.0%)	1(2.6%)
School-B	39	9	23.0	2 (5.1%)	1(2.6%)	1(2.6%)	1(2.6%)	1(2.6%)	1(2.6%)	2(5.1%)
School-C	38	8	21.0	1(2.6%)	1(2.6%)	0(0.0%)	1(2.6%)	2(5.3%)	1(2.6%)	1(2.6%)
School-D	38	9	16.0	2(5.3%)	1(2.6%)	0(0.0%)	1(2.6%)	2(5.3%)	1(2.6%)	1(2.6%)
School-E	40	8	20.0	1(2.6%)	0(0.0%)	1(2.5%)	1(2.5%)	2(5.0%)	1(2.5%)	1(2.5%)
Total	193	42	21.8	8 (4.15%)	4(2.07%)	2(1.04%)	5(2.59%)	9(4.66%)	4 (2.07%)	6(3.11%)

N=193

Table 6: Prevalence of Intestinal Parasite Infections (IPIs) in Studied Schools

Schools	**No. examined**	**No. infected (f)**	**Prevalence**	**Helminthes**						
				A.lumbricoides	**T.trichiura**	**S.stercoralis**	**Others**	**E. histolytica**	**G. lamblia**	**Others**
School-A	40	10	25.0	3 (7.5%)	1(2.5%)	0(0.0%)	2(5.0%)	2(5.0%)	0(0.0%)	1 (2.5%)
School-B	38	8	21.0	2 (5.3%)	1(2.6%)	0(0.0%)	1(2.6%)	2(5.3%)	0(0.0%)	1(2.6%)
School-C	40	12	30.0	2(5.0%)	1(2.5%)	1(2.5%)	2(5.0%)	2(5.0%)	2(5.0%)	2(5.0%)

School-D	39	9	23.0	2 (5.1%)	1(2.6%)	1(2.6%)	1(2.6%)	1(2.6%)	1(2.6%)	2(5.1%)
School-E	40	11	28.0	2(5.0%)	1(2.5%)	0(0.0%)	1(2.5%)	2(5.0%)	2(5.0%)	2(5.0%)
School-F	38	8	21.0	1(2.6%)	1(2.6%)	0(0.0%)	1(2.6%)	2(5.3%)	1(2.6%)	1(2.6%)
School-G	40	8	20.0	1(2.6%)	0(0.0%)	1(2.5%)	1(2.5%)	2(5.0%)	1(2.5%)	1(2.5%)
School-H	41	10	24.0	2(4.88%)	1(2.44%)	0(0.0%)	1(2.44%)	2(2.88%)	2(4.88%)	2(2.88%)
School-I	41	9	22.0	1(2.44%)	1(2.44%)	1(2.44%)	1(2.44%)	2(2.88%)	1(2.44%)	1(2.44%)
School-J	38	9	16.0	2(5.3%)	1(2.6%)	0(0.0%)	1(2.6%)	2(5.3%)	1(2.6%)	1(2.6%)
Total	395	94	23.8	18(4.6%)	9(2.3%)	4(1.0%)	12 (3.0%)	19(4.8%)	11(2.8%)	14(3.5%)

Table 7: Prevalence of Intestinal Parasite Infections (IPIs) in Relation to Age Group in Public Schools

Age group (years)	**No. examined**	**No. infected (*f*)**	**Prevalence**	**Helminthes**						
				A.lumbricoides	*T.trichiura*	*S.stercoralis*	Others	*E. histolytica*	*G. lamblia*	Others
8-10	64	17	26.6	5 (7.8)	2(3.1)	1(1.6)	3(4.7)	4(6.3)	3(4.7)	3(4.7)
11-13	82	22	26.8	3 (3.7)	2 (2.4)	1(1.2)	2(2.4)	4 (4.9)	2(2.4)	3(3.7)
14-15	56	13	23.2	2(3.6)	1(1.8)	0(0.0)	2(3.6)	2(3.6)	2(3.6)	2(3.6)
Total	202	52	25.7	10 (4.95%)	5(2.48%)	2(0.99%)	7(3.47%)	10(4.95%)	7(3.47%)	8(3.96%)

N=202

Table 8: Prevalence of Intestinal Parasite Infections (IPIs) in Relation to Age Group in Private Schools

Age group (years)	No. examined	No. infected (*f*)	Prevalence	Helminthes						
				A.lumbricoides	*T.trichiura*	*S.stercoralis*	Others	*E. histolytica*	*G. lamblia*	Others
8-10	70	18	25.7	4 (5.7%)	2(2.9%)	1 (1.4%)	2(2.9%)	3(4.3%)	2(2.9%)	3(4.3%)
11-13	61	12	19.7	2 (3.3%)	1(1.6%)	0(0.0%)	2(3.3%)	3(4.9%)	1(1.6%)	2(3.3%)
14-15	62	12	19.4	2(3.2%)	1(1.6%)	1(1.6%)	1(1.6%)	3(4.8%)	1(1.6%)	1(1.6%)
Total	193	42	21.8	8 (4.15%)	4(2.07%)	2(1.04%)	5(2.59%)	9(4.66%)	4 (2.07%)	6(3.11%)

N=193

Table 9: Prevalence of Intestinal Parasite Infections (IPIs) in Relation to Age Group

Age group (years)	No. examined	No. infected (*f*)	Prevalence	***Helminthes***						
				A.lumbricoides	*T.trichiura*	*S.stercoralis*	Others	*E. histolytica*	*G. lamblia*	Others
8-10	134	35	26.1	9 (6.7%)	4(3.0%)	2 (1.5%)	5(3.7%)	7(5.2%)	5(3.7%)	6(4.5%)
11-13	143	34	23.8	5 (3.5%)	3(2.1%)	1(0.7%)	4(2.8%)	7 (4.9%)	3(2.1%)	5(3.5%)
14-15	118	25	21.2	4(3.4%)	2(1.7%)	1(0.8%)	3(2.5%)	5(4.2%)	3(2.5%)	3(2.5%)
Total	395	94	23.8	18(4.6%)	9(2.3%)	4(1.0%)	12 (3.0%)	19(4.8%)	11(2.8%)	14(3.5%)

N=395

Table 10: Prevalence of Intestinal Parasite Infections (IPIs) in Relation to Sex in Public Schools

Gender	No. examined	No. infected (*f*)	Prevalence	Helminthes						
				A.lumbricoides	*T.trichiura*	*S.stercoralis*	Others	*E. histolytica*	*G. lamblia*	Others
Boys	95	21	22.1	4 (4.2%)	1(1.1%)	1(1.1%)	3(3.2%)	4(4.2%)	3 (3.2%)	3(3.2%)
Girls	107	31	29.0	6 (5.6%)	4(3.7%)	1(0.9%)	4 (3.7%)	6(5.6 %)	4(3.7%)	5(4.7%)
Total	202	52	23.8	10 (4.95%)	5(2.48 %)	2(0.99%)	7(3.47 %)	10(4.95 %)	7(3.47 %)	8(3.96 %)

N=202

Table 11: Prevalence of Intestinal Parasite Infections (IPIs) in Relation to Sex in Private Schools

Gender	No. examined	No. infected (f)	Prevalence	Helminthes						
				A.lumbricoides	T.trichiura	S.stercoralis	Others	E. histolytica	G. lamblia	Others
Boys	82	18	22.0	3 (3.7%)	2(2.4%)	1(1.2%)	3(3.7%)	4(4.9%)	2(2.4%)	2(2.4%)
Girls	111	24	21.6	5 (4.5%)	2(1.8%)	1(0.9%)	2(1.8%)	5(4.5%)	2(1.8%)	4(3.6%)
Total	193	42	21.8	8 (4.15%)	4(2.07%)	2(1.04%)	5(2.59 %)	9(4.66 %)	4 (2.07 %)	6(3.11 %)

N=193

Table 12: Prevalence of Intestinal Parasite Infections (IPIs) in Relation to Sex

Gender	No. examined	No. infected (*f*)	Prevalence	Helminthes						
				A.lumbricoides	*T.trichiura*	*S.stercoralis*	Others	*E. histolytica*	*G. lamblia*	Others
Boys	177	39	22.0	7 (4.0%)	3(1.7%)	2(1.1%)	6(3.4%)	8(4.5%)	5(2.8%)	5(2.8%)
Girls	218	55	25.2	11 (5.0%)	6(2.8%)	2(0.9%)	6(2.8%)	11(5.0%)	6(2.8%)	9(4.1%)
Total	395	94	23.8	18 (4.6%)	9 (2.3%)	4 (1.0%)	12 (3.0%)	19 (4.8%)	11 (2.8%)	14 (3.5%)

N=3

DISCUSSION

This cross-sectional study examined intestinal-parasite infections (IPIs) and associated risk factors among 395 primary-school children (202 public, 193 private) in Yenagoa, Bayelsa State. Socio-demographic profile show that Females predominated (≈55 %); the modal age was 11-13 years (36.2 %). Public schools contributed slightly more participants (51.1 % vs 48.9 %). Overall prevalence IPIs were detected in 23.8 % of children, comparable to earlier Bayelsa reports (Gbonhinbor et al., 2022) but higher than rates in Wukari (9.2 %; Anyiam and Imarenezor, 2024) and Rivers State (21.0 %; Abah & Awi-Waadu, 2018). In terms of School-type differences, Prevalence was higher in public schools (25.7 %) than private schools (21.8 %). The three most common helminths across both sectors were Ascaris lumbricoides (4.6 %), Trichuris trichiura (2.3 %) and Strongyloides stercoralis (1.0 %); protozoa were dominated by Entamoeba histolytica (4.8 %) and Giardia lamblia (2.8 %). Risk factors such as environmental conditions (poor sanitation, limited clean water) and low socioeconomic status favour transmission (Funso-Aina et al., 2020). Barefoot play and geophagy likely explain the detection of A. lumbricoides, T. trichiura and S. stercoralis (Okpala et al., 2014). No statistically significant differences were found by age or gender ($p > 0.05$), consistent with several Nigerian studies (Achi et al., 2017; Abah & Arene, 2015; Udensi et al., 2015). Public-health implications show moderate IPI burden warrants school-based health-education on hand-washing, safe water use and footwear. Periodic mass deworming and screening can reduce prevalence. Improving water, sanitation and hygiene (WASH) infrastructure in schools and communities is essential. Recommendations are;

1. Implement compulsory hygiene-education modules in primary curricula.
2. Establish regular IPI screening and treatment (deworming) programmes.
3. Upgrade WASH facilities in schools; ensure access to clean water and safe latrines.
4. Engage parents and community leaders in awareness campaigns.
5. Strengthen surveillance to monitor trends and evaluate interventions.

REFERENCES

Abah, A. E., & Arene, F. O. I. (2015). Status of intestinal parasitic infections among primary school children in Rivers State, Nigeria. *Journal of Parasitology Research*, 2015.

Abraham, C., & Sheeran, P. (2015). The health belief model. In *Predicting health behaviour: Research and practice with social cognition models* (2nd ed., pp. 30–55).

Ahmed, M. (2023). Intestinal parasitic infections in 2023. *Gastroenterology Research*, *16*(3), 127.

Akgun, Y. (1996). Intestinal obstruction caused by *Ascaris lumbricoides*. *Diseases of the Colon & Rectum*, *39*(10), 1159–1163.

Al Amin, A. S. M., & Wadhwa, R. (2023, July 17). Helminthiasis. In *StatPearls* [Internet]. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK560525/

Albonico, M. (2003). Methods to sustain drug efficacy in helminth control programmes. *Acta Tropica*, *86*(2–3), 233–242.

Albonico, M., Bickle, Q., Ramsan, M., Montresor, A., Savioli, L., & Taylor, M. (2003). Efficacy of mebendazole and levamisole alone or in combination against intestinal nematode infections after repeated targeted mebendazole treatment in Zanzibar. *Bulletin of the World Health Organization*, *81*, 343–352.

Aponte-Pieras, J., Mesgun, S., Hong, A., Farooqui, T., Elmofti, Y., Lankarani, D., ... & Saud, B. (2022). Symptomatic anemia due to trichuriasis. *ACG Case Reports Journal*, *9*(7), e00826.

Anyiam, V. I., & Imarenezor, E. P. K. (2024). Parasitic causes associated with diarrhea and dysentery in children in Wukari, North East, Nigeria. *Int. J. Adv. Multidisc. Res. Stud*, *4*(5), 1–5.

Arora, D. R., & Arora, B. B. (2010). *Medical parasitology* (3rd ed.). CBS Publishing.

Arosoye, A. S. (2018). Survey of human intestinal parasites in communities within Ibadan, Southwestern, Nigeria. *Acta Scientific Microbiology*, *1*, 61–67.

Bansal, D., Gupta, P., Singh, G., Bhatia, M., & Singla, H. (2018). Intestinal parasitic infestation in school going children of Rishikesh, Uttarakhand, India. *Indian Journal of Community Health*, *30*(1), 45–50.

Bercu, T. E., Petri, W. A., & Behm, B. W. (2007). Amebic colitis: New insights into pathogenesis and treatment. *Current Gastroenterology Reports*, *9*, 429–433.

Brooker, S., Kabatereine, N. B., Tukahebwa, E. M., & Kazibwe, F. (2004). Spatial analysis of the distribution of intestinal nematode infections in Uganda. *Epidemiology & Infection*, *132*(6), 1065–1071.

Cabrera, B. D. (1985). Parasites: Treatment and prevention of infestation. *JOICFP Review*, (9), 6–11.

Centers for Disease Control and Prevention. (2024, February 20). Diagnosing pinworms. https://www.cdc.gov/pinworm/diagnosing/index.html

Conner, M., & Norman, P. (2015). *Predicting and changing health behaviour: Research and practice with social cognition models*. McGraw-Hill Education.

Conterno, L. O., Turchi, M. D., Corrêa, I., & de Barros Almeida, R. A. M. (2020). Anthelmintic drugs for treating ascariasis. *Cochrane Database of Systematic Reviews*, 2020(4), CD010599. https://doi.org/10.1002/14651858.CD010599.pub2

Cook, G. C. (1994). *Enterobius vermicularis* infection. *Gut*, *35*(9), 1159.

Cornick, S., & Chadee, K. (2017). *Entamoeba histolytica*: Host parasite interactions at the colonic epithelium. *Tissue Barriers*, *5*(1), e1283386.

Coyle, C. M., Varughese, J., Weiss, L. M., & Tanowitz, H. B. (2012). Blastocystis: To treat or not to treat.... *Clinical Infectious Diseases*, *54*(1), 105–110.

Dagne, N., & Alelign, A. (2021). Prevalence of intestinal protozoan parasites and associated risk factors among school children in Merhabete District, Central Ethiopia. *Journal of Parasitology Research*, 2021.

De Graaf, M., Beck, R., Caccio, S. M., Duim, B., Fraaij, P. L., Le Guyader, F. S., ... & Schultsz, C. (2017). Sustained fecal-oral human-to-human transmission following a zoonotic event. *Current Opinion in Virology*, *22*, 1–6.

de Lima Corvino, D. F., & Horrall, S. (2023, July 17). Ascariasis. In *StatPearls* [Internet]. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK430796/

Denkinger, C. M., Harigopal, P., Ruiz, P., & Dowdy, L. M. (2008). *Cryptosporidium parvum*-associated sclerosing cholangitis in a liver transplant patient. *Transplant Infectious Disease*, *10*(2), 133–136.

Di Genova, B. M., & Tonelli, R. R. (2016). Infection strategies of intestinal parasite pathogens and host cell responses. *Frontiers in Microbiology*, *7*, 179467.

Dudlová, A., Juriš, P., Jurišová, S., Jarčuška, P., & Krčméry, V. (2016). Epidemiology and geographical distribution of gastrointestinal parasitic infection in humans in Slovakia. *Helminthologia*, *53*(4), 309–317.

Duguma, T., Worku, T., Sahile, S., & Asmelash, D. (2023). Prevalence and associated risk factors of intestinal parasites among children under five years of age attended at Bachuma Primary Hospital, West Omo Zone, Southwest Ethiopia: A cross-sectional study. *Journal of Tropical Medicine*, 2023.

Dziuban, E. J., Liang, J. L., Craun, G. F., Hill, V., Yu, P. A., Painter, J., ... & Beach, M. J. (2006). Surveillance for waterborne disease and outbreaks associated with recreational water—United States, 2003–2004. *MMWR Surveill Summ*, *55*(12), 1–30.

Elghareeb, A. S., Younis, M. S., El Fakahany, A. F., Nagaty, I. M., & Nagib, M. M. (2015). Laboratory diagnosis of *Blastocystis* spp. in diarrheic patients. *Tropical Parasitology*, *5*(1), 36–41.

El Safadi, D., Cian, A., Nourrisson, C., Pereira, B., Morelle, C., Bastien, P., ... & Viscogliosi, E. (2016). Prevalence, risk factors for infection and subtype distribution of the intestinal parasite *Blastocystis* sp. from a large-scale multi-center study in France. *BMC Infectious Diseases*, *16*, 1–11.

Else, K. J., Keiser, J., Holland, C. V., Grencis, R. K., Sattelle, D. B., Fujiwara, R. T., ... & Cooper, P. J. (2020). Whipworm and roundworm infections. *Nature Reviews Disease Primers*, *6*(1), 44.

Erismann, S., Diagbouga, S., Odermatt, P., Knoblauch, A. M., Gerold, J., Shrestha, A., ... & Cissé, G. (2016). Prevalence of intestinal parasitic infections and associated risk factors among schoolchildren in the Plateau Central and Centre-Ouest regions of Burkina Faso. *Parasites & Vectors*, *9*, 1–14.

Fauziah, N., Aviani, J. K., Agrianfanny, Y. N., & Fatimah, S. N. (2022). Intestinal parasitic infection and nutritional status in children under five years old: A systematic review. *Tropical Medicine and Infectious Disease*, *7*(11), 371.

Fotedar, R., Stark, D., Beebe, N., Marriott, D., Ellis, J., & Harkness, J. (2007). Laboratory diagnostic techniques for *Entamoeba* species. *Clinical Microbiology Reviews*, *20*(3), 511–532.

Fox, L. M., & Saravolatz, L. D. (2005). Nitazoxanide: A new thiazolide antiparasitic agent. *Clinical Infectious Diseases*, *40*(8), 1173–1180.

Funso-Aina, O. I., Chineke, H. N., & Adogu, P. O. (2020). A review of prevalence and pattern of intestinal parasites in Nigeria (2006–2015). *European Journal of Medical and Health Sciences*, *2*(1).

Gebru, H., Deyissia, N., Medhin, G., & Kloos, H. (2023). The association of sanitation and hygiene practices with intestinal parasitic infections among under-14 children in rural Dire Dawa, Eastern Ethiopia: A community based cross-sectional study. *Environmental Health Insights*, *17*, 11786302231180801.

Gerace, E., Presti, V. D. M. L., & Biondo, C. (2019). *Cryptosporidium* infection: Epidemiology, pathogenesis, and differential diagnosis. *European Journal of Microbiology and Immunology*, *9*(4), 119–123.

Gbonhinbor, J., Abah, A. E., & Awi-Waadu, G. (2022). Prevalence of intestinal parasitic infection and associated risk factors among primary school-aged children (5–15 years) in Southern Nigeria. *International Journal of Infection*, *9*(3).

Ghodeif, A. O., & Jain, H. (2023, June 15). Hookworm. In *StatPearls* [Internet]. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK546648/

Gilchrist, C. A. (2014). *Entamoeba bangladeshi*: An insight. *Tropical Parasitology*, *4*, 96–98.

Gonzales, M. L. M., Dans, L. F., & Sio-Aguilar, J. (2019). Antiamoebic drugs for treating amoebic colitis. *Cochrane Database of Systematic Reviews*, 2019(1).

Gupta, R., Rayamajhee, B., Sherchan, S. P., Rai, G., Mukhiya, R. K., Khanal, B., & Rai, S. K. (2020). Prevalence of intestinal parasitosis and associated risk factors among school children of Saptari district, Nepal: A cross-sectional study. *Tropical Medicine and Health*, *48*, 1–9.

Haghighi, A., & Rezaeian, M. (2005). Detection of serum antibody to *Entameba histolytica* in various population samples of amebic infection using an enzyme-linked immunosorbent assay. *Parasitology Research*, *97*, 209–212.

Haque, R. (2007). Human intestinal parasites. *Journal of Health, Population and Nutrition*, *25*(4), 387.

Haque, R., Huston, C. D., Hughes, M., Houpt, E., & Petri, W. A., Jr. (2003). Amebiasis. *The New England Journal of Medicine*, *348*(16), 1565–1573.

Hakizimana, E., Kim, J. Y., Oh, S., Yoon, M., & Yong, T. S. (2023). Intestinal parasitic infections among children aged 12–59 months in Nyamasheke District, Rwanda. *Parasites, Hosts and Diseases*, *61*(3), 304.

Hemphill, A., Müller, N., & Müller, J. (2019). Comparative pathobiology of the intestinal protozoan parasites *G. lamblia*, *Entamoeba histolytica*, and *Cryptosporidium parvum*. *Pathogens*, *8*(3), 116.

Ince, M. N., & Elliott, D. E. (2021). 114-Intestinal worms. In *Sleisenger and Fordtran's Gastrointestinal and Liver Disease* (pp. 1847–1867). Elsevier Inc.

Janz, N. K., & Becker, M. H. (1984). The health belief model: A decade later. *Health Education Quarterly*, *11*(1), 1–47.

Jeffrey, H. C., Leach, R. M., & Cowan, G. O. (2001). *Atlas of medical helminthology and protozoology*. Churchill Livingstone.

Jourdan, P. M., Lamberton, P. H., Fenwick, A., & Addiss, D. G. (2018). Soil-transmitted helminth infections. *The Lancet*, *391*(10117), 252–265.

Kalichman, S. C., Di Berto, G., & Eaton, L. (2008). Human immunodeficiency virus viral load in blood plasma and semen: Review and implications of empirical findings. *Sexually Transmitted Diseases*, *35*(1), 55–60.

Kamau, P., Aloo-Obudho, P., Kabiru, E., Ombacho, K., Langat, B., Mucheru, O., & Ireri, L. (2012). Prevalence of intestinal parasitic infections in certified food-handlers working in food establishments in the City of Nairobi, Kenya. *Journal of Biomedical Research*, *26*(2), 84–89.

Kang, W. H., & Jee, S. C. (2019). *Enterobius vermicularis* (pinworm) infection. *The New England Journal of Medicine*, *381*(1), e1.

Kantzanou, M., Karalexi, M. A., Vrioni, G., & Tsakris, A. (2021). Prevalence of intestinal parasitic infections among children in Europe over the last five years. *Tropical Medicine and Infectious Disease*, *6*(3), 160.

Keller, L., Patel, C., Welsche, S., Schindler, T., Hürlimann, E., & Keiser, J. (2020). Performance of the Kato-Katz method and real time polymerase chain reaction for the diagnosis of soil-transmitted helminthiasis in the framework of a randomised controlled trial: Treatment efficacy and day-to-day variation. *Parasites & Vectors*, *13*, 1–12.

Khuroo, M. S. (1996). Ascariasis. *Gastroenterology Clinics of North America*, *25*(3), 553–577.

Kick, G., Ruëff, F., & Przybilla, B. (2002). Palmoplantar pruritus subsiding after *Blastocystis hominis* eradication. *Acta Dermato-Venereologica*, *82*(1), 60.

Kirby, H. (2023). *Materials and methods in the study of protozoa*. University of California Press.

Koot, B. G., ten Kate, F. J., Juffrie, M., Rosalina, I., Taminiau, J. J., & Benninga, M. A. (2009). Does *G. lamblia* cause villous atrophy in children?: A retrospective cohort study of the histological abnormalities in giardiasis. *Journal of Pediatric Gastroenterology and Nutrition*, *49*(3), 304–308.

Koruk, I., Simsek, Z., Tekin Koruk, S., Doni, N., & Gürses, G. (2010). Intestinal parasites, nutritional status and psychomotor development delay in migratory farm worker's children. *Child: Care, Health and Development*, *36*(6), 888–894.

Kumanan, T., Sujanitha, V., & Sreeharan, N. (2020). Amoebic liver abscess: A neglected tropical disease. *The Lancet Infectious Diseases*, *20*(2), 160–162.

Lanker, K. C., Muhummed, A. M., Cissé, G., Zinsstag, J., Hattendorf, J., Yusuf, R. B., ... & Vonaesch, P. (2023). Prevalence and associated risk factors of intestinal parasitic infections among children in pastoralist and agro-pastoralist communities in the Adadle Woreda of the Somali Regional State of Ethiopia. *PLOS Neglected Tropical Diseases*, *17*(7), e0011448.

Lauwaet, T., Davids, B. J., Reiner, D. S., & Gillin, F. D. (2007). Encystation of *G. lamblia*: A model for other parasites. *Current Opinion in Microbiology*, *10*(6), 554–559.

Liang, S. Y., Chan, Y. H., Hsia, K. T., Lee, J. L., Kuo, M. C., Hwa, K. Y., ... & Ji, D. D. (2009). Development of loop-mediated isothermal amplification assay for detection of *Entamoeba histolytica*. *Journal of Clinical Microbiology*, *47*(6), 1892–1895.

Loukas, A., Hotez, P. J., Diemert, D., Yazdanbakhsh, M., McCarthy, J. S., Correa-Oliveira, R., ... & Bethony, J. M. (2016). Hookworm infection. *Nature Reviews Disease Primers*, *2*(1), 1–18.

McDougald, L. R. (2020). Internal parasites. In *Diseases of Poultry* (pp. 1157–1191).

McKellar, K., & Sillence, E. (2020). Current research on sexual health and teenagers. In K. McKellar & E. Sillence (Eds.), *Teenagers, sexual health information and the digital age* (pp. 5–23). Academic Press. https://doi.org/10.1016/B978-0-12-816969-8.00002-3

Mekonnen, H. S., & Ekubagewargies, D. T. (2019). Prevalence and factors associated with intestinal parasites among under-five children attending Woreta Health Center, Northwest Ethiopia. *BMC Infectious Diseases*, *19*, 1–8.

Minetti, C., Chalmers, R. M., Beeching, N. J., Probert, C., & Lamden, K. (2016). Giardiasis. *BMJ*, 355.

Mishra, A., Sharma, A. K., & Tewari, V. (2018). Intact parasite-antigen ELISA test: A new dimension for serodiagnosis of amoebiasis. *Journal of Applied and Natural Science*, *10*(3), 976–980.

Mitre, E., & Klion, A. D. (2021). Eosinophils and helminth infection: Protective or pathogenic? *Seminars in Immunopathology*, *43*(3), 363–381.

Mugenda, O. M., & Mugenda, A. G. (2003). *Research methods: Quantitative & qualitative approaches* (Vol. 2, No. 2). Acts Press.

Ok, K. S., Kim, Y. S., Song, J. H., Lee, J. H., Ryu, S. H., Lee, J. H., ... & Lee, H. K. (2009). *Trichuris trichiura* infection diagnosed by colonoscopy: Case reports and review of literature. *The Korean Journal of Parasitology*, *47*(3), 275.

Onbasi, K., Sin, A. Z., Doganavsargil, B., Onder, G. F., Bor, S., & Sebik, F. (2005). Eosinophil infiltration of the oesophageal mucosa in patients with pollen allergy during the season. *Clinical & Experimental Allergy*, *35*(11), 1423–1431.

Padukone, S., Mandal, J., Rajkumari, N., Bhat, B. V., Swaminathan, R. P., & Parija, S. C. (2018). Detection of *Blastocystis* in clinical stool specimens using three different methods and morphological examination in Jones' medium. *Tropical Parasitology*, *8*(1), 33–40.

Patel, B., Sharma, T., Bhatt, G. C., & Dhingra Bhan, B. (2015). *Enterobius vermicularis*: An unusual cause of recurrent urinary tract infestation in a 7-year-old girl: Case report and review of the literature. *Tropical Doctor*, *45*(2), 132–134.

Picciano, A. G. (2021). Theories and frameworks for online education: Seeking an integrated model. In *A guide to administering distance learning* (pp. 79–103). Brill.

Priyadarshi, R. N., Sherin, L., Kumar, R., Anand, U., & Kumar, P. (2021). CT of amebic liver abscess: Different morphological types with different clinical features. *Abdominal Radiology*, *46*(9), 4148–4158.

Pullan, R. L., Smith, J. L., Jasrasaria, R., & Brooker, S. J. (2014). Global numbers of infection and disease burden of soil transmitted helminth infections in 2010. *Parasites & Vectors*, *7*, 1–19.

Rawla, P., & Sharma, S. (2023, August 1). *Enterobius vermicularis*. In *StatPearls* [Internet]. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK536974/

Rogers, D. C., & Thorp, J. H. (Eds.). (2019). *Thorp and Covich's freshwater invertebrates: Volume 4: Keys to Palaearctic fauna*. Academic Press.

Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1994). The health belief model and HIV risk behavior change. In *Preventing AIDS: Theories and methods of behavioral interventions* (pp. 5–24). Springer US.

Sastry, A. S., & Bhat, S. (2018). *Essentials of medical parasitology*. JP Medical Ltd.

Schlosser-Brandenburg, J., Midha, A., Mugo, R. M., Ndombi, E. M., Gachara, G., Njomo, D., ... & Hartmann, S. (2023). Infection with soil-transmitted helminths and their impact on coinfections. *Frontiers in Parasitology*, *2*, 1197956.

Sekar, U., & Shanthi, M. (2013). *Blastocystis*: Consensus of treatment and controversies. *Tropical Parasitology*, *3*(1), 35–39.

Sethi, S., Puri, A., Sachdeva, S., & Dalal, A. (2020). Erythrophagocytosis in colonic mucosa: Real-time amazing display. *BMJ Case Reports*, *13*(12).

Shamsuzzaman, S. M., & Hashiguchi, Y. (2002). Thoracic amebiasis. *Clinics in Chest Medicine*, *23*(2), 479–492.

Sienzel, D. J., Boreham, P. F. L., & McDougall, R. (1991). Ultrastructure of *Blastocystis hominis* in human stool samples. *International Journal for Parasitology*, *21*(7), 807–812.

Singh, A. K., Das, G., Roy, B., Nath, S., Naresh, R., & Kumar, S. (2015). Prevalence of gastro-intestinal parasitic infections in goat of Madhya Pradesh, India. *Journal of Parasitic Diseases*, *39*, 716–719.

Siochou, A., Birtsou, H., & Papazahariadou, M. (2008). *Enterobius vermicularis* infection of female genital tract. *International Journal of Immunopathology and Pharmacology*, *21*(4), 1031–1033.

Soriano, L. R., Del Mundo, F., & Naguit-Sim, L. (1966). Rectal prolapse in children with trichuriasis. *Journal of the Philippine Islands Medical Association*, *42*(12), 843–848.

Sousa, J., Hawkins, R., Shenoy, A., Petroze, R., Mustafa, M., Taylor, J., ... & Islam, S. (2022). *Enterobius vermicularis*-associated appendicitis: A 22-year case series and comprehensive review of the literature. *Journal of Pediatric Surgery*, *57*(8), 1494–1498.

Stanley, S. L. (2003). Amoebiasis. *The Lancet*, *361*(9362), 1025–1034.

Tan, K. S. (2008). New insights on classification, identification, and clinical relevance of *Blastocystis* spp. *Clinical Microbiology Reviews*, *21*(4), 639–665.

Tegen, D., & Damtie, D. (2021). Prevalence and risk factors associated with intestinal parasitic infection among primary school children in Dera district, Northwest Ethiopia. *Canadian Journal of Infectious Diseases and Medical Microbiology*, 2021.

Troeger, H., Epple, H. J., Schneider, T., Wahnschaffe, U., Ullrich, R., Burchard, G. D., ... & Schulzke, J. D. (2007). Effect of chronic *G. lamblia* infection on epithelial transport and barrier function in human duodenum. *Gut*, *56*(3), 328–335.

Tuo, N. E. E., Kouadio, J. N. G., Ouattara, M., Coulibaly, G., Silué, D. E. K., Coulibaly, J. T., & N'Goran, E. E. K. (2023). Prevalence and risk factors of intestinal parasitic infections in school-aged children in the urban area of Abobo, Abidjan, Cte dIvoire. *Journal of Parasitology and Vector Biology*, *15*(1), 26–35.

Tyoalumun, K., Abubakar, S., & Christopher, N. (2016). Prevalence of intestinal parasitic infections and their association with nutritional status of rural and urban pre-school children in Benue State, Nigeria. *International Journal of MCH and AIDS*, *5*(2), 146.

Ukaga, C. N., Onyeka, P. I. K., & Nwoke, B. E. B. (2002). *Practical medical parasitological for biological and medical students*. Avan Global Publication.

Usip, L. P. E., Awah, I. G., Afia, U. U., Nworie, C. J., Okoro, M., Adams, E., & Okonoinyang, S. (2023). Prevalence of intestinal parasites and associated risk factors among primary school children in Uyo Akwa Ibom State, Nigeria. *World*, *15*(1), 69–77.

Varyani, F., Fleming, J. O., & Maizels, R. M. (2017). Helminths in the gastro-intestinal tract as modulators of immunity and pathology. *American Journal of Physiology-Gastrointestinal and Liver Physiology*, *312*(6), G537–G549. https://doi.org/10.1152/ajpgi.00024.2017

Viswanath, A., Yarrarapu, S. N. S., & Williams, M. (2023, August 14). *Trichuris trichiura* infection. In *StatPearls* [Internet]. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK507843/

Vivancos, V., González-Alvarez, I., Bermejo, M., & Gonzalez-Alvarez, M. (2018). Giardiasis: Characteristics, pathogenesis and new insights about treatment. *Current Topics in Medicinal Chemistry*, *18*(15), 1287–1303.

Waghmare, M., Shah, H., Tiwari, C., Khedkar, K., & Gandhi, S. (2017). Management of liver abscess in children: Our experience. *Euroasian Journal of Hepato-Gastroenterology*, *7*(1), 23.

Wang, W., Bielefeldt-Ohmann, H., Traub, R. J., Cuttell, L., & Owen, H. (2014). Location and pathogenic potential of *Blastocystis* in the porcine intestine. *PLOS ONE*, *9*(8), e103962.

Watkins, R. R., & Eckmann, L. (2014). Treatment of giardiasis: Current status and future directions. *Current Infectious Disease Reports*, *16*, 1–8.

Wei, K. Y., Yan, Q., Tang, B., Yang, S. M., Zhang, P. B., Deng, M. M., & Lü, M. H. (2017). Hookworm infection: A neglected cause of overt obscure gastrointestinal bleeding. *The Korean Journal of Parasitology*, *55*(4), 391.

Wendt, S., Trawinski, H., Schubert, S., Rodloff, A. C., Mössner, J., & Lübbert, C. (2019). The diagnosis and treatment of pinworm infection. *Deutsches Ärzteblatt International*, *116*(13), 213.

World Health Organization. (2023, January 18). Soil-transmitted helminth infections. https://www.who.int/news-room/fact-sheets/detail/soil-transmitted-helminth-infections

Wuerz, T., Kane, J. B., Boggild, A. K., Krajden, S., Keystone, J. S., Fuksa, M., ... & Anderson, J. (2012). A review of amoebic liver abscess for clinicians in a nonendemic setting. *Canadian Journal of Gastroenterology and Hepatology*, *26*, 729–733.

Yaeger, R. G. (2011). *Protozoa: Structure, classification, growth, and development.*

Yoseph, A., & Beyene, H. (2020). The high prevalence of intestinal parasitic infections is associated with stunting among children aged 6–59 months in Boricha Woreda, Southern Ethiopia: A cross-sectional study. *BMC Public Health*, *20*, 1–13.

Zaman, V., Howe, J., & Ng, M. (1995). Ultrastructure of *Blastocystis hominis* cysts. *Parasitology Research*, *81*, 465–469.

Zulfiqar, H., Mathew, G., & Horrall, S. (2023, June 25). Amebiasis (archived). In *StatPearls* [Internet]. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK519535/