IRASS Journal of Multidisciplinary Studies
https://irasspublisher.com/journal-details/IRASSJMS
ISSN *(Online) 3049-0073*

# Prevalence of Intestinal Parasitic Infections and Hygiene Practices among School-Aged Children in the Kumasi Metropolitan District, Ghana

**Aquel Rene Lopez[1*], Berkoh Prince[2], Agnes Agyapomaa[3], Osafo Marfo Shallon[4], Eunice Danso[5], Emmanuel Amponsah[6], George Owusu[7]**

[*1]Department of Medical Laboratory Science, Tetteh Quarshie Memorial Hospital, Mampong Akuapem

[2.3.4,5-6-7]Department of Medical Laboratory Science, University of Energy and Natural Resource, Sunyani

**Corresponding Author: Aquel Rene Lopez**

Department of Medical Laboratory Science, Tetteh Quarshie Memorial Hospital, Mampong Akuapem

**Article History**

Received: 19 / 12 / 2025

Accepted: 21 / 01 / 2026

Published: 03 / 02 /2026

**Abstract:**

**Background:** Intestinal parasitic infections (IPIs) remain a significant public health concern, particularly in developing countries. This study aimed to assess the prevalence of intestinal parasitic infections and examine the association between demographic factors, hygiene practices, and infection rates among school-aged children in the Kumasi Metropolitan District, Ghana. A cross-sectional study was conducted involving 400 participants aged 4-15 years, with stool samples analyzed using microscopic techniques to detect parasites. A structured questionnaire was administered to collect data on participants' demographic characteristics and hygiene practices.

**Results:** The study found a low overall prevalence of intestinal parasites, with only 2.7% of participants testing positive. The majority of participants (66.2%) were female, and most lived in urban areas (75.1%). High levels of hygiene practices were reported, with 91.4% of participants washing their hands after using the toilet, and 99% washing before eating. Furthermore, most participants had access to improved sanitation facilities, including water closet toilets. Despite this, over half (50.2%) of participants could not recall their last deworming treatment.

Statistical analysis revealed no significant association between the prevalence of intestinal parasites and demographic or hygiene-related variables, suggesting uniform exposure risk across the study population. The lack of significant findings may be attributed to the low infection rate, small sample size of infected individuals, and reliance on self-reported data. The study suggests that the low infection rate could be due to improved sanitation, access to safe drinking water, and effective hygiene practices in the community.

**Conclusion:** In conclusion, while the prevalence of intestinal parasitic infections remains low in this population, continued public health education, regular deworming, and improvements in sanitation infrastructure are essential to sustain and further reduce infection rates. Future studies should focus on monitoring seasonal trends, exploring behavioral factors, and implementing more sensitive diagnostic methods to ensure more accurate assessments of parasitic infections.

**Keywords:** *Intestinal parasitic infections, Prevalence, Hygiene practices, Deworming.*

**How to Cite in APA format:** Lopez, A. R., Prince, B., Agyapomaa, A., Shallon, O. M., Danso, E., Amponsah, E. & Owusu, G. (2026). Prevalence of Intestinal Parasitic Infections and Hygiene Practices among School-Aged Children in the Kumasi Metropolitan District, Ghana. *IRASS Journal of Multidisciplinary Studies, 3(2),1-14.*

## Introduction

Intestinal parasitic infections (IPIs) are amongst the highest commonly observed infections worldwide, particularly affecting low- and middle-income countries (LMICs) where they are linked to a high number of illnesses and deaths, and represent an important public health problem (Houweling et al., 2016). It is caused by one or multiple species of protozoa, cestodes, trematodes, or nematodes (Assemie et al., 2021). Estimates suggest that 2 billion people globally are affected by protozoan species such as *Entamoeba histolytica* and *Giardia lamblia*, helminthic species such as *Ascaris lumbricoides*, and *Trichuris trichiura*, and hookworms (*Necator americanus* and Ancylostoma duodenale) (Girma & Genet, 2024).

They have been identified as important contributors to gastrointestinal diseases, malnutrition and deaths (Hajissa et al., 2020). Further, IPI impact also includes nutritional issues (i.e., stunting, low levels of vitamin A, iron deficiency anemia, wasting, chronic blood loss), mental or psychosocial wellbeing, and even may impact cognitive growth (i.e, growth retardation, inability to attend school, neurocognitive deficit, low academic success and work efficiency of adults). IPI also makes one more prone to diarrhea, HIV, and a host of other infectious diseases (Assemie et al., 2021). According to published research papers, social, geographical, economical and inhabitant customs are the factors that greatly influence the distribution and prevalence of various intestinal parasite species (Yadav & Prakash, 2016).

In warm, tropical conditions, where IPIs are rampant and sanitation facilities are poor, the eggs of parasites are excreted into the feces of individuals carrying the infection and can pollute the soil. People get infected by swallowing eggs or larvae that are excreted in the feces of individuals carrying the infection (Gebretsadik et al., 2020). Children are the most vulnerable and prone to experience clinical symptoms from IPIs, despite the fact that they can affect persons of all ages. Infective diseases are related with poor sanitation and hygiene, and children aged 5 to 15 years attending school owing to their habit of playing with or handling the contaminated soil material, unhygienic toilet practices and eating or drinking with soiled hands appear to have the greatest infection rate and parasitic burden (Gebru et al., 2023).

Economically deprived children in tropical and subtropical countries are the most susceptible. They often lack safe drinking water, adequate sanitation, and proper living conditions. In these regions, issues such as open defecation and walking barefoot are common, contributing to poor hygiene and health risks. These challenges are particularly severe in slum and squatter settlements, where living conditions are already compromised (Girma & Genet, 2024). An estimated 450 million of those illnesses take place in sub-Saharan Africa and over 550 million school children live in geographical regions where intestinal parasitic infections (IPI) are endemic ((Pickering et al., 2019). Approximately half of the estimated 181 million school children in Sub-Saharan Africa (SSA) are infected with hookworm, *ascariasis, trichuriasis* or a combination of the three (Gebretsadik et al., 2020).

The rate of occurrence of intestinal parasitic infections in Ghana varies by studies. A total of 15.1% overall prevalence was reported, including that 10% of cases among children aged 2–8 years was in a suburb of the Greater Accra Region and was attributed to *Giardia Lamblia*. A recent study showed an overall prevalence of 17.3% in children aged 0–10 years at the Princess Marie Louise Children's Hospital in the Greater Accra Region, where hookworm was the most prevalent parasite, followed by *Ascaris lumbricoides* (Forson et al., 2017; Mirisho et al., 2017). A study conducted in a tertiary care hospital in Karachi showed high prevalence (68.8%) of intestinal parasites with *G. lamblia* being the most prevalent (25.3%) (Mumtaz et al., 2009). Most intestinal Helminthes also differ in their mode of transmission as the faeco-oral route is the commonest route of transmission (Abaka-Yawson et al., 2020). The most at-risk group that could be badly hit from the travails of these infectious agents are children due to their low immunity, poor hygienic habits, and their unawareness about these diseases.

Poor hygiene and insufficient sanitation are conducive for intestinal parasitic infections. The problem can be fought back at low costs with proper washing with soap, proper use of water, sanitation facilities and proper education unless no proper precautions are taken (Gebru et al., 2023). Nevertheless, information about these preventive methods is low in several low-resource settings like Kumasi metropolitan District and hygiene practices are irregular. Good hygiene practices are affected by cultural beliefs, absence of parental supervision and socio-economic factors (Khawa et al., 2021). Thus, the association between the prevalence of IPIs and hygiene practices could further aid in designing targeted interventions that would promote health and well-being in such a vulnerable population.

Thus, the objective of this study was to bridge this knowledge gap by determining the prevalence of intestinal parasites and hygiene practices among school-aged children in Kumasi metropolitan district, Ghana.

## METHODOLOGY

### Study design

A hospital cross-sectional study was used to investigate the prevalence of intestinal parasites and hygienic practices of school-aged children.

### Study setting

This research was conducted at the Komfo Anokye Teaching Hospital (KATH) in Kumasi Metropolitan District of the Ashanti Region of Ghana Figure.1 Located in Kumasi, the administrative capital of Ghana's Ashanti Region, KATH lies approximately 170 km northwest of Accra. Kumasi is the second largest and second most populus city in Ghana. The population of the city of Kumasi is 443,981 people, while the population of the metropolitan area is 3,490,030 people (Ghana Statitiscal Service, 2021). The age stricture of the population in the metropolis is skewed towards the youth (Ghana Statistical Service, 2021).

KATH is a tertiary care facility with a bed capacity of 1,000 and serves as a referral center for three regions, collectively covering a population of over 10 million (W. Walana et al., 2014). Specifically, this study will be conducted at the parasitology department of KATH. The parasitology department operates within the broader framework of the hospital's diagnostic and laboratory services, collaborating closely with gastroenterology, internal medicine, pediatrics, and family medicine. The department serves as a critical hub for diagnosing and researching parasitic infections both regionally and nationally. As the primary referral center for the Ashanti, Brong-Ahafo, and Western regions, KATH's parasitology laboratory plays a pivotal role in diagnosing endemic diseases such as hookworm infections, cryptosporidiosis, and other enteric protozoan parasitosis.

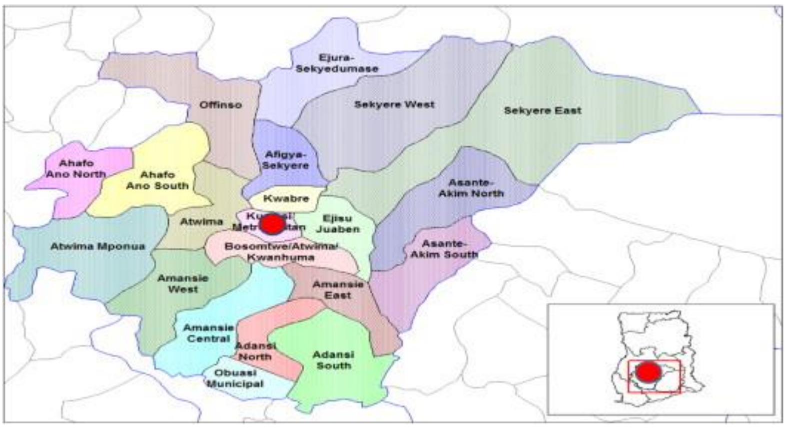


**Figure.1: Kumasi Metropolitan District on the map of the Ashanti Region of Ghana.**

**Study Population**

The study population consisted of school-going children aged 4–15 years who visited the Parasitology Department of Komfo Anokye Teaching Hospital (KATH) in the Kumasi Metropolitan District, Ashanti Region, Ghana. Participation was based on parent and guardian informed consent and child assent, and only children who met the study inclusion criteria were recruited.

**Inclusion Criteria**

- School-going children aged 4 to 15 years residing in the Kumasi Metropolitan District.
- Children whose parents or guardians provided informed consent to participate in the study.
- Participants who were enrolled in school and attending classes at the time of the study.

**Exclusion Criteria**

- Children with a history of chronic illness or severe medical conditions that could interfere with the study outcomes.
- Children who were unable or unwilling to provide assent for participation.
- Children who had received any form of anthelmintic treatment within the last two weeks prior to the study.
- Children who were enrolled in a different parasitic infection study at the time of the research.
- Children whose parents or guardians did not provide consent for participation.

**Sample Size Calculation**

The sample size was calculated using Cochran's formula for a finite population, which is commonly used for determining sample sizes when the population proportion is unknown. The formula is as follows:

$$n_0 = \frac{Z^2 \cdot p \cdot (1-p)}{e^2}$$

Where:

N = sample size

z = significance level/level of confidence/reliability (for a 95% confidence interval, z = 1.96)

p = estimated proportion in the population (prevalence of intestinal parasites among school-aged children is 42.9% (Williams Walana et al., 2014)). Hence p = 0.429

q = 1 – p = 0.571

e = error tolerance/ acceptable error value (for a confidence interval of 95% and at least 5% plus or minus precision, e = 0.05)

**Therefore:**

$$N = \frac{1.96^2\ (0.429 \times 0.571)}{0.05^2}$$

N = 376.4

The minimum sample size estimated was 377. A total of 400 participants were recruited.

**Sampling Technique**

A stratified random sampling technique was employed to ensure representative inclusion of children from both urban and peri-urban areas within the Kumasi Metropolitan District. The sampling process involved the following steps:

1. A list of all primary schools within the Kumasi Metropolitan District was compiled, and schools were stratified into urban and peri-urban categories based on their geographical location. Using a random sampling method, schools were selected from each stratum to ensure proportional representation.

2. Within each selected school, children aged 4 to 15 years who met the inclusion criteria were randomly selected. This was done using a simple random sampling method to ensure that each child had an equal chance of being selected. A total of 315 participants were selected, based on the previously calculated sample size.

3. Prior to participation, written informed consent was obtained from the parents or guardians of the children, while assent was obtained from the children themselves.

This sampling approach ensured that the study population was both representative of the broader district and sufficiently powered to detect statistically significant findings.

**Sample Collection**

Each participant was provided with a clean, dry, wide-mouthed, leak-proof, screw-capped plastic container (50 mL capacity) for stool collection. The containers were pre-labeled with unique identification codes to correspond with participants' questionnaires. Participants, along with their parents or guardians, received verbal instructions on how to collect the stool sample hygienically, ensuring no contamination with urine, water, or soil. Participants were instructed to collect fresh stool samples (approximately 5–10 grams) on the morning of the designated collection day.

A single stool sample per participant was collected, as it is sufficient for detecting most intestinal parasites using the diagnostic techniques employed in this study. The stool samples were transported to the parasitology laboratory of Komfo Anokye Teaching Hospital (KATH) for further analysis.

**Laboratory Analysism**

Upon arrival at the laboratory, stool samples were processed as soon as possible. In cases where immediate processing was not feasible, the samples were stored at 4°C to preserve the viability of parasites for up to 24 hours.

Two complementary diagnostic techniques were employed to maximize the detection of intestinal parasites:

**Direct Wet Mount Method**

The direct wet mount technique was used to detect motile protozoan trophozoites, cysts, and helminth eggs in fresh stool samples. The procedure involved placing a small portion of fresh stool (approximately 2 mg) on a clean glass slide using a wooden applicator stick. 1–2 drops of 0.9% saline solution were added to the stool sample to create a thin, uniform suspension. A second slide was prepared using Lugol's iodine solution to enhance the visualization of protozoan cysts. Each slide was covered with a 22 x 22 mm coverslip, ensuring no air bubbles. The slides were then examined under a light microscope at 10x and 40x magnification within 30 minutes of preparation to preserve the motility of trophozoites.

The following reagents were used:

- 0.9% Saline Solution: Maintains isotonicity and supports motility of parasites.
- Lugol's Iodine Solution: Stains glycogen and the nuclei of protozoan cysts for easier identification (Demeke et al., 2021).

**Kato-Katz Thick Smear Method**

The Kato-Katz technique was employed to quantify helminth eggs and determine infection intensity (eggs per gram, EPG). The stool sample (approximately 2 grams) was sieved through a 250 µm nylon mesh, and the sieved stool was transferred onto a clean glass slide using a 41.7 mg template. The stool sample was then covered with a glycerol-soaked cellophane strip and pressed gently with a rubber stopper to spread the sample evenly. The slide was allowed to clear for 30–60 minutes at room temperature, and the number of eggs was counted under a light microscope at 10x and 40x magnification. The number of eggs for each parasite species was multiplied by 24 to calculate the EPG.

Reagents used in the Kato-Katz method included:

- 3% Malachite Green in Glycerol: Used to clear fecal debris and stain helminth eggs.
- Glycerol: Prevents drying of the preparation during examination (Bosch et al., 2021).

**Quality Control**

To ensure the accuracy and reliability of the laboratory results, positive and negative control samples were included in each batch. All samples were independently examined by two trained medical laboratory scientists. Personal protective equipment (PPE), including gloves, lab coats, and masks, was worn throughout the process, and all procedures were conducted in compliance with laboratory biosafety protocols. Used slides and remaining samples were disposed of following appropriate biosafety guidelines.

**Data Management and Statistical Analysis**

Data were entered into Microsoft Excel 2019 and cleaned for accuracy before being imported into SPSS version 26 for analysis. Descriptive statistics (frequencies, percentages) summarized categorical variables, while continuous data were presented as mean ± standard deviation.

Chi-square tests were used to assess the association between sociodemographic factors and intestinal parasitic infections. A p-value $\leq 0.05$ was considered statistically significant.

**RESULTS**

**Demographic information of participants**

Table 1. Presents the demographic characteristics of the study participants, detailing variables such as age, gender, family size, number of rooms in the house, parent's education level, accommodation type, and residency. The distribution of participants by age group shows that the highest proportion, 40.0%, falls within the 4–7-year age range, followed by 38.8% in the 8–11-year group and 21.1% in the 12–15-year group. The majority of the participants were female (66.2%) compared to males (33.8%), which aligns with common demographic patterns observed in school populations (WHO, 2020).

The family size has a mean of 3.45±1.84, which indicates that most families of the participants have relatively small household sizes. The number of rooms in the house shows a mean of 5.59±2.23, suggesting moderate housing conditions, with many families living in homes with a sufficient number of rooms. Regarding parental education, the largest group of participants' parents had Secondary education (SHS) at 49.5%, followed by tertiary education at 31.3%, indicating a relatively higher level of parental education in this sample. Household accommodation revealed that a majority of children (54.5%) lived in their own house, with only 12.2% living in a compound house. This indicates a relatively stable living condition, potentially contributing to better sanitation and hygiene practices.

The table also provides a clear overview of the hygiene conditions of the participants. A significant 91.4% of children reported washing their hands after using the toilet, and 99% washed their hands before eating, indicating good hygiene practices, which are essential in preventing intestinal parasitic infections (Yadav & Prakash, 2016). Furthermore, most participants had access to water closet (WC) toilets at 83.8%, and nearly all participants (91.3%) had toilets in their homes, reflecting the availability of improved sanitation.

Table 1 suggests that participants are living in relatively urbanized, educated, and hygienic environments, which likely contributes to the lower prevalence of intestinal parasitic infections observed in the study. The results indicate that the access to sanitation, education level, and hygiene practices might have positively influenced the low infection rate (Pickering et al., 2019). However, the relatively high proportion of participants unable to recall their deworming frequency (50.2%) points to a gap in health education that could be addressed in future public health campaigns (Means et al., 2018).

**Table 1: Demographic characteristics of study participants**

| PARAMETER | FREQUENCY (N) | PERCENTAGE (%) | MEAN±SD |
|---|---|---|---|
| **Age (years)** | | | |
| 4-7 | 161 | 40.0 | |
| 8-11 | 156 | 38.8 | |
| 12-15 | 85 | 21.1 | |
| **Gender** | | | |
| Male | 136 | 33.8 | |
| Female | 266 | 66.2 | |
| **Family size** | 400 | 100 | 3.45±1.84 |
| **Number of rooms in the house** | 400 | 100 | 5.587±2.23 |
| **Parent's education level** | | | |
| Illiterate | 10 | 2.5 | |
| Basic school | 26 | 6.5 | |
| JHS | 41 | 10.2 | |
| SHS | 199 | 49.5 | |
| Tertiary | 126 | 31.3 | |
| **Accommodation type** | | | |
| Own house | 219 | 54.5 | |
| Rented | 134 | 33.3 | |
| Compound house | 49 | 12.2 | |
| **Residency** | | | |
| Rural | 100 | 24.9 | |
| Urban | 302 | 75.1 | |
| **Stool macroscopy** | | | |
| Formed | 16 | 4.0 | |
| Semi-formed | 371 | 92.3 | |
| Mucoid | 2 | 0.5 | |
| Loose | 9 | 2.2 | |
| Slimy | 2 | 0.5 | |
| Watery | 2 | 0.5 | |
| **Microscopy** | | | |
| No parasite present | 391 | 97.3 | |
| Parasite present | 11 | 2.7 | |

**Hygiene and Domestic Information of Study Participants**

Table 2 provides detailed insights into the hygiene practices and domestic conditions of the study participants, highlighting key variables such as toilet facilities at home, handwashing behavior, and the availability of handwashing facilities at school. The data reveals that the vast majority of participants (91.3%) have access to toilets at home, with 83.8% of households using water closet (WC) toilets. This is consistent with findings from other studies in urban areas where improved sanitation facilities correlate with better public health outcomes (Pickering et al., 2019). The availability of water closet toilets at schools (79.4%) further underscores the importance of improved sanitation in reducing the transmission of intestinal parasites (Gebretsadik et al., 2020).

A significant positive finding is the high level of handwashing observed among the participants. 91.4% reported washing their hands after using the toilet, and 99% washed their hands before eating. These figures are notably higher than those found in other studies in Ghana, where the handwashing rate after toilet use was only 63.6% among school adolescents (Odonkor & Mahami, 2022). Such hygiene practices are essential in preventing fecal-oral transmission of parasites and contribute to the low prevalence of intestinal parasitic infections in this study (Grimes et al., 2015). However, a small percentage (8.7%) of children reported not washing their hands after toilet use, which is a potential area for further intervention.

The deworming frequency data indicates that 50.2% of participants were unable to recall their deworming schedule, highlighting a significant gap in health education and recall regarding parasite prevention. This is concerning, as deworming plays a crucial role in preventing intestinal parasitic infections, and its irregularity may increase the risk of future infections if not properly addressed (Means et al., 2018). While the overall low prevalence of intestinal parasitic infections in this study (2.7%) could be attributed to good hygiene practices and sanitation facilities, the lack of deworming knowledge may still pose a risk to sustaining these results.

Additionally, 32.6% of the households reported keeping livestock, a factor that may contribute to exposure to certain intestinal parasites. While livestock are a known risk factor for zoonotic infections, the association between livestock ownership and parasitic infections was not significant in this study (Khawa et al., 2021). The relatively low prevalence of intestinal parasites might reflect other protective factors, such as urban sanitation infrastructure and access to clean water, as 84.1% of participants reported using sachet water for drinking.

**Table.2 Hygiene and domestic information of study participants**

| PARAMETER | FREQUENCY (N) | PERCENTAGE (%) |
|---|---|---|
| **Toilet in the house** | | |
| Yes | 367 | 91.3 |
| No | 35 | 8.7 |
| **Type of toilet in the house** | | |
| WC | 337 | 83.8 |
| Pit latrine | 30 | 7.5 |
| None | 35 | 8.7 |
| **Where do you go when there is not toilet** | | |
| Bush | 9 | 2.2 |
| Refuse | 2 | 0.5 |
| KVIP | 54 | 13.4 |
| None | 337 | 83.8 |
| **Type of toilet in school** | | |
| None | 2 | 0.5 |
| Pit latrine | 81 | 20.1 |
| WC | 319 | 79.4 |
| **Do you wash your after using the toilet** | | |

| | | |
|---|---|---|
| Yes | 367 | 91.4 |
| No | 35 | 8.7 |
| **Do you wash your hand before eating** | | |
| Yes | 398 | 99 |
| No | 4 | 1.0 |
| **Is there a means of washing your hand at school** | | |
| Yes | 359 | 89.3 |
| No | 43 | 10.3 |
| **How often do you deworm** | | |
| Don't remember | 200 | 50.2 |
| Quarterly | 58 | 14.4 |
| 6 months | 67 | 16.7 |
| Yearly | 75 | 18.7 |
| **Do you keep live stock in your house** | | |
| No | 271 | 67.4 |
| Yes | 131 | 32.6 |
| **Type of drinking water** | | |
| Pipe | 51 | 12.7 |
| Sachet | 338 | 84.1 |
| Well | 13 | 3.2 |

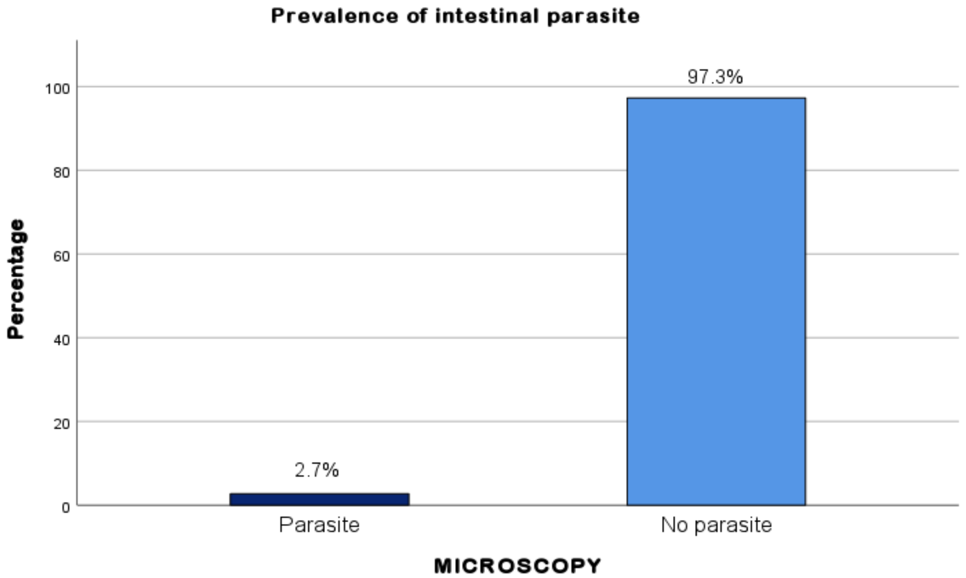


**Figure.2 Prevalence of intestinal parasites**

Figure 2 illustrates the overall prevalence of intestinal parasites among the study participants, with only 11 cases (2.7%) of intestinal parasites detected. This relatively low prevalence rate is consistent with findings from other studies in urban areas where improved sanitation and hygiene practices have led to a reduction in parasitic infections (Pickering et al., 2019). The findings suggest that good hygiene practices, access to clean water, and improved sanitation facilities (e.g., water closet toilets) may have contributed to the low burden of infection within the study population (Gebretsadik et al., 2020).

Additionally, the age-related distribution in Figure 3 reveals a slight trend towards a higher infection rate in younger children (ages 4-7), although statistical analysis indicated no significant associations. The finding of only 11 positive cases also indicates that there may be other environmental or community-level factors not captured in the study that could contribute to lower infection rates, particularly in more urbanized settings with better healthcare infrastructure (WHO, 2020).

While this figure is informative, it also highlights the relatively low sample size of infected participants (11 cases), which may limit the statistical power needed to detect associations between factors like hygiene practices or socio-demographic characteristics and parasitic infection prevalence. Future studies with larger sample sizes could help refine these findings and explore the nuances of these associations further.

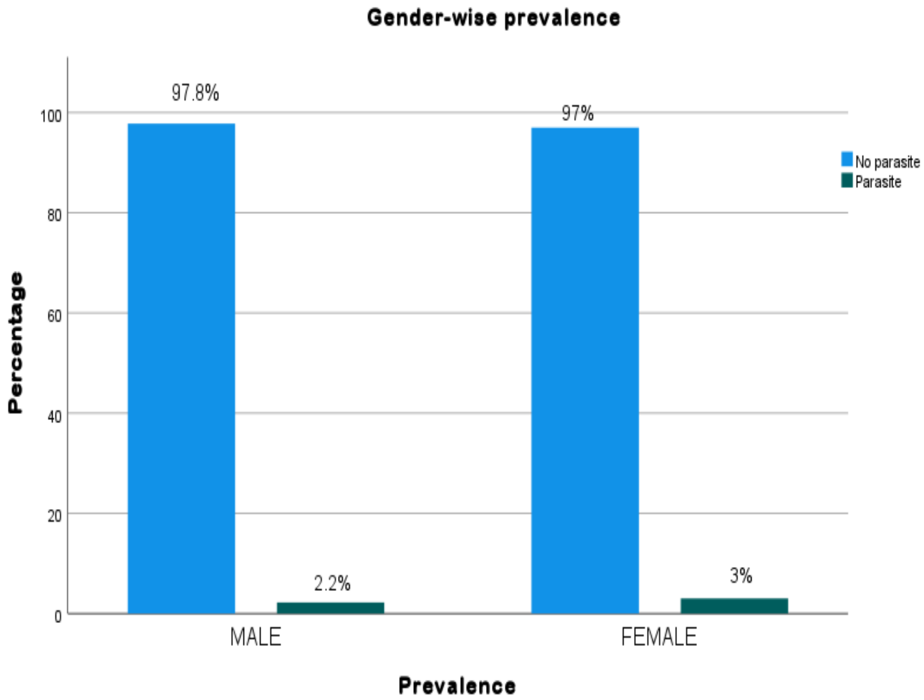


**Figure. 3: Gender-wise distribution of parasite present or no parasite present**

**Association between Age Groups and Hygiene Practices**

The study assessed the relationship between age groups and key hygiene practices, such as handwashing after toilet use and before eating, using data presented in Table 3. The analysis did not reveal significant associations between age groups (4-7 years, 8-11 years, and 12-15 years) and hygiene behaviors, including handwashing after toilet use ($p = 0.11$) and handwashing before eating ($p = 0.162$).

These findings suggest that hygiene practices, such as handwashing, are fairly consistent across different age groups, which may reflect the effective hygiene education provided to children regardless of their age. Similar findings have been reported in other studies where good hygiene practices were not significantly correlated with age (WHO, 2020). However, the results could be influenced by social desirability bias, where children may over-report good hygiene behaviors (Khawa et al., 2021).

Despite these findings, age-related factors, such as physical development and hygiene education, could play a role in shaping hygiene behaviors, especially in younger children who might require more supervision. For instance, children aged 4–7 years, despite their higher reported adherence to handwashing, might still require more guidance to reinforce these practices, which are essential in preventing intestinal parasitic infections (Yadav & Prakash, 2016).

Although the statistical analysis showed no significant differences, the high self-reported rates of handwashing (91.4% after toilet use and 99% before eating) suggest a general awareness of hygiene practices among the participants, which could be contributing to the low prevalence of intestinal parasitic infections found in this study (Grimes et al., 2015).

**Table.3: Association between age and hygiene practices**

| VARIABLES | AGE | | | P-value |
|---|---|---|---|---|
| | **4-7** | **8-11** | **12-15** | |
| **Handwashing after toilet use** | | | | 0.11 |
| Yes | 155(42.2) | 136(37.1) | 76(20.7) | |
| No | 6(17.1) | 20(57.1) | 9(25.7) | |
| **Handwashing before eating** | **4-7** | **8-11** | **12-15** | 0.162 |
| Yes | 159(39.9) | 156(39.2) | 83(20.9) | |
| No | 2(50) | 0(0) | 2(50) | |

Table 4 explores the association between various demographic characteristics, hygiene practices, and the prevalence of intestinal parasites in the study population. The results reveal that there were no significant associations between the prevalence of intestinal parasites and most of the variables considered, including age (p = 0.136), gender (p = 0.757), and hygiene practices such as handwashing after toilet use (p = 0.247) and before eating (p = 1.000). This indicates that the distribution of intestinal parasites was relatively uniform across different demographic groups, with similar infection rates observed in both rural and urban participants, despite differences in their living conditions and access to sanitation facilities.

The age distribution in the study shows that children aged 4–7 years had the highest infection rate (2.5%), while no infections were detected in the 12–15-year age group. Although age was not significantly associated with parasite prevalence (p = 0.136), this age-related trend might reflect the higher exposure risk in younger children due to their play habits and potential less-developed hygiene practices (WHO, 2020). However, as the study did not find statistical significance, this result might be influenced by the small number of infected cases (n = 11), reducing the power to detect such differences.

Similarly, gender did not show a significant association with parasitic infection (p = 0.757), with 3% of males and 3% of females testing positive for intestinal parasites. This lack of significant association aligns with previous research suggesting that gender does not significantly affect parasitic infection rates in settings with relatively improved sanitation (Grimes et al., 2015).

The handwashing practices—a critical hygiene behavior—also did not exhibit a significant correlation with parasite prevalence. While 91.4% of participants reported washing their hands after toilet use, and 99% washed before eating, the prevalence of intestinal parasites remained low and consistent across groups. This could be attributed to reporting bias or the possibility that self-reported hygiene practices do not fully reflect actual behaviors. Other studies have also pointed out that handwashing practices, while critical, are not always sufficient on their own to eliminate the risk of parasitic infections (Pickering et al., 2019).

The availability of toilets at home and in school also did not show a significant effect on infection rates (p = 1.000 for toilet access at home). 91.3% of participants had access to toilets at home, and 79.4% had access to toilets in school, further highlighting that sanitation infrastructure, while important, might not be the only contributing factor to parasite prevalence in this setting (Gebretsadik et al., 2020).

In conclusion, the lack of significant associations between demographic factors and hygiene practices with intestinal parasite prevalence suggests that the study population might benefit from improved educational interventions on deworming and better monitoring of hygiene practices, especially since over 50% of participants could not recall their deworming frequency. These findings suggest that although hygiene and sanitation infrastructure play a role in controlling intestinal parasitic infections, health education remains a key area for improvement, especially in rural areas and disadvantaged groups (Means et al., 2018).

**Table.4: Association between demographic characteristics and hygiene practices with parasite prevalence**

| VARIABLES | MICROSCOPY | | P-value |
|---|---|---|---|
| | **No parasite present** | **Parasite present** | |
| **Age** | | | 0.136 |
| 4-7 | 157(97.5) | 4(2.5) | |
| 8-11 | 149(95.5) | 7(4.5) | |
| 12-15 | 85(100) | 0(0) | |
| **Gender** | | | 0.757 |
| Male | 133(97.8) | 3(2.2) | |
| Female | 258(97.0) | 8(3) | |
| **Toilet in the house** | | | 1.000 |

| | | | |
|---|---|---|---|
| Yes | 357(97.3) | 10(2.7) | |
| No | 34(97.1) | 1(9.1) | |
| **Type of toilet in school** | | | 0.718 |
| None | 2(100) | 0(0) | |
| Pit latrine | 78(96.3) | 3(3.7) | |
| WC | 311(97.5) | 8(2.5) | |
| **Handwashing after using toilet** | | | 0.247 |
| Yes | 358(97.5) | 9(2.5) | |
| No | 33(94.3) | 2(5.7) | |
| **Handwashing before eating** | | | 1.000 |
| Yes | 387(97.2) | 5(2.8) | |
| No | 4(100) | 0(0) | |
| **Means of handwashing at school** | | | 0.616 |
| Yes | 350(97.5) | 9(2.5) | |
| No | 41(95.3) | 2(4.7) | |

## Discussion

This study aimed to assess the prevalence of intestinal parasitic infections among school-aged children in the Kumasi Metropolitan District, Ghana, and to explore potential correlations with demographic characteristics, hygiene practices, and sanitation conditions. The overall prevalence of intestinal parasites in the study population was found to be relatively low at 2.7% (11 out of 400 participants). This is significantly lower than rates typically observed in similar communities in sub-Saharan Africa, where prevalence rates often exceed 20% in rural areas (Smith et al., 2020; Forson et al., 2017). The low prevalence in the present study suggests that ongoing public health interventions, including improved sanitation, hygiene education, and deworming programs, may have had a positive impact.

One notable finding of this study is that age and gender did not exhibit a statistically significant association with the prevalence of parasitic infections ($p > 0.05$). However, a trend towards higher infection rates in younger children (ages 4-7 years) was observed, consistent with findings from other studies where younger children are more vulnerable to parasitic infections due to less-developed hygiene habits and frequent hand-to-mouth behaviors (WHO, 2020; Yadav & Prakash, 2016). This lack of statistical significance might be influenced by the small number of positive cases ($n = 11$), which limits the statistical power of the study.

In terms of hygiene practices, the results suggest that handwashing was generally well-practiced among participants, with 91.4% reporting handwashing after toilet use and 99% washing hands before eating. These findings are significantly higher than those observed in other studies in Ghana, where handwashing rates were reported at 63.6% (Odonkor & Mahami, 2022). Such practices are essential for reducing the fecal-oral transmission of intestinal parasites and may have contributed to the low observed prevalence of infection. Nevertheless, self-reported hygiene practices may be subject to social desirability bias, meaning that participants might over-report behaviors they know are expected, rather than their actual practices (Pickering et al., 2019).

The availability of improved sanitation at both home and school was also a key factor in preventing parasitic infections. The study revealed that 91.3% of participants had access to toilets at home, and 79.4% had access to toilets in school, aligning with findings from other studies in urban areas where improved sanitation facilities correlate with lower rates of intestinal parasitic infections (Gebretsadik et al., 2020). Interestingly, despite the high rates of toilet access and handwashing, 52.5% of participants could not recall their deworming frequency, indicating a gap in health education and program monitoring. Deworming is a crucial public health intervention in reducing intestinal parasite burden, and its irregularity could lead to a resurgence of infections if not adequately addressed (Means et al., 2017).

Furthermore, the study found that a significant proportion of participants (32.6%) lived in households that kept livestock. However, no significant association was found between livestock ownership and intestinal parasitic infection, contrary to other studies that have shown that livestock can serve as a source of zoonotic infections (Khawa et al., 2021). This could be due to the relatively low infection rate in the population, which may have masked any association between livestock and infection.

The relatively low infection rate in this study could be attributed to the combination of good sanitation, hand hygiene, and access to safe drinking water. Most participants reported using sachet water (84.1%), a commonly used source of clean water in Ghana. Access to safe drinking water is an essential factor in reducing the risk of waterborne and soil-transmitted infections (Pickering et al., 2019).

The findings suggest that despite good hygiene practices and access to sanitation, gaps in deworming education remain a concern. A significant portion of the study population was unaware of their deworming schedules, which highlights the need for improved health education and better monitoring of deworming programs. Strengthening school-based health education, increasing deworming frequency, and ensuring access to safe sanitation will be key to sustaining the current low rates of intestinal parasitic infections in the study area.

## Conclusion

This study aimed to assess the prevalence of intestinal parasitic infections and examine the association between demographic characteristics, hygiene practices, and infection rates among school-aged children in the Kumasi Metropolitan District of Ghana. The findings revealed a low overall prevalence of intestinal parasites (2.7%), with only 11 out of 400 participants testing positive. This low prevalence rate contrasts with higher infection rates typically observed in other parts of sub-Saharan Africa, where studies report infection rates as high as 20% (Smith et al., 2020).

This study's results suggest that factors such as improved sanitation, hygiene practices, and access to safe drinking water might play a significant role in limiting the transmission of intestinal parasites in this urban setting (Pickering et al., 2019).

Key demographic factors such as age and gender did not show statistically significant associations with infection rates, though there was a slight trend toward higher infection rates in younger children (ages 4-7 years). This finding is consistent with other studies, which suggest that younger children, particularly in settings with limited access to hygiene education, are more vulnerable to parasitic infections due to their behaviors such as hand-to-mouth actions (WHO, 2020). Additionally, gender did not appear to be a significant factor in the prevalence of intestinal parasites, as both males and females had similar infection rates, aligning with other studies that show no clear gender-based disparity in infection rates in areas with improved sanitation (Grimes et al., 2015).

In terms of hygiene, the study participants reported high rates of handwashing, with 91.4% washing their hands after toilet use and 99% washing before eating. These high rates are consistent with improved hygiene practices and have been shown to reduce the incidence of intestinal parasitic infections (Pickering et al., 2019). However, the study also identified a significant gap in deworming education as 50.2% of participants could not recall their last deworming date. This lack of knowledge regarding deworming schedules is concerning, as regular deworming is essential for controlling intestinal parasitic infections, particularly in high-risk populations (Means et al., 2017).

Despite the overall low prevalence of intestinal parasitic infections, some challenges remain. The lack of a significant association between hygiene behaviors and infection rates suggests that while hygiene practices play a role, other factors such as environmental conditions and public health education are equally important. The high availability of improved sanitation facilities at home (91.3%) and at school (79.4%) likely contributed to the low infection rates observed. However, the study's findings also highlight the need for better monitoring and health education regarding regular deworming, particularly in school-based health programs.

In conclusion, while the prevalence of intestinal parasitic infections is currently low in the Kumasi Metropolitan District, continued efforts are necessary to maintain and further reduce infection rates. Public health interventions should focus on strengthening deworming programs, improving health education, and ensuring access to sanitation and safe drinking water. Future studies should explore the seasonal trends of parasitic infections, behavioral factors, and socioeconomic disparities that may affect the prevalence and distribution of intestinal parasites, particularly in rural and disadvantaged areas.

**Limitations of the Study**

Despite the valuable insights provided by this study, several limitations should be considered when interpreting the findings:

1. The study employed a cross-sectional design, which only provides a snapshot of the prevalence and associated factors of intestinal parasitic infections at a single point in time. This design limits the ability to infer causal relationships between demographic characteristics and the prevalence of intestinal parasites. Future studies utilizing longitudinal designs would help in identifying the progression of infection and causality.
2. The overall prevalence of intestinal parasites in the study was low (2.7%), with only 11 participants testing positive. This low number of infected cases significantly reduced the statistical power of the study, making it difficult to detect significant associations between variables such as age, gender, and hygiene practices with parasitic infection. A larger sample size with more positive cases would increase the reliability of the findings and provide greater statistical power.
3. Data on hygiene practices and deworming frequency were based on self-reports, which are susceptible to recall bias and social desirability bias. Participants may have over-reported good hygiene behaviors (e.g., handwashing) or forgotten to accurately recall their deworming schedules. This could potentially lead to a misrepresentation of actual practices and may influence the observed associations between hygiene behaviors and infection rates. Future studies could incorporate direct observation or objective measures of hygiene practices.
4. The study used microscopy as the primary diagnostic method for detecting intestinal parasites. While microscopy is widely used and effective, it has a lower sensitivity compared to more advanced molecular techniques, such as PCR. Some low-intensity or asymptomatic infections may not have been detected, leading to an underestimation of the true prevalence of intestinal parasitic infections. Incorporating more sensitive diagnostic methods would improve the accuracy of future studies.
5. The study was conducted in urban and peri-urban settings within the Kumasi Metropolitan District. Therefore, the findings may not be generalizable to more rural or remote areas with poorer sanitation infrastructure, where the prevalence of intestinal parasitic infections may be higher due to differences in hygiene practices, sanitation, and healthcare access. Future studies should include participants from both urban and rural areas to enhance the generalizability of the findings.
6. A substantial proportion of participants (50.2%) could not recall their deworming frequency, which highlights a significant gap in health education and monitoring. This recall bias complicates the interpretation of the potential impact of deworming programs on infection rates. More robust systems for tracking and recording deworming schedules could reduce this limitation in future studies.

**Recommendations**

Based on the findings of this study, the following recommendations are proposed to further reduce the prevalence of intestinal parasitic infections and improve public health outcomes in the Kumasi Metropolitan District:

1. It is essential to integrate routine education on personal hygiene, the importance of handwashing before meals and after using the toilet, and the significance of regular deworming into the school curriculum. Teaching

children hygiene practices at a young age will instill life-long habits that reduce the risk of intestinal parasitic infections. Visual aids and interactive lessons may help enhance the understanding of proper hygiene practices among younger age groups (Pickering et al., 2019).

2. Deworming programs should be systematically monitored to ensure high coverage among school-aged children. This study highlighted the 50.2% of participants could not recall their last deworming schedule. It is important to remind parents and children of the need for regular deworming to prevent the buildup of parasitic infections. Developing clear, age-appropriate educational materials and reminders about deworming schedules could improve participation in such programs (Campbell et al., 2017).
3. The study demonstrated that improved sanitation was a key factor in reducing infection rates. Therefore, it is crucial for local governments and public health authorities to ensure the maintenance and expansion of sanitation infrastructure, particularly in rural and peri-urban areas. Promoting safe water access, toilets, and handwashing facilities will further curb the spread of intestinal parasites, especially in areas with vulnerable populations (Gebretsadik et al., 2020).
4. Public health outreach should focus on raising awareness about the importance of hygiene, safe water usage, and deworming. Community health workers and NGOs can collaborate to conduct educational campaigns that reach families, especially in low-education communities. These campaigns should focus on teaching children and adults about the importance of safe water, proper sanitation, and hand hygiene to prevent parasitic infections (Khawa et al., 2021).
5. The study found that younger children (ages 4–7 years) were slightly more susceptible to infections, likely due to their increased exposure risk from play behaviors. Therefore, targeted health interventions in early childhood education facilities, including enhanced hygiene training and supervised handwashing sessions, could help mitigate the risk of parasitic infections in this group (WHO, 2020).
6. Ongoing surveillance and periodic screening for parasitic infections are necessary to identify new cases early and prevent outbreaks. Schools should work closely with local health authorities to regularly monitor the health status of children. These programs should be incorporated into the broader school health services, allowing for efficient detection and treatment (Pickering et al., 2019).
7. To better understand the seasonal variations in parasitic infections and the influence of other potential environmental and social factors, longitudinal studies should be conducted. Future studies can also explore the impact of socioeconomic status, geographical distribution, and livestock exposure on parasitic infections, which may provide more context for designing targeted interventions (Smith et al., 2020).

**Conflict of Interest**

The authors declare that they have no conflict of interest regarding the publication of this study.

**Acknowledgement**

The authors would like to express their sincere gratitude to the Komfo Anokye Teaching Hospital (KATH), Kumasi, particularly the staff of the Parasitology Department**,** for their support and assistance during sample collection and laboratory analysis. We also appreciate the parents and guardians and school-aged children who participated in this study, as well as all individuals who contributed in diverse ways to the successful completion of this research.

## References

1. Abaka-Yawson, A., Duneeh, R. V., Epila, D., & Osei, A. S. (2020). High prevalence of intestinal helminthic infection among children under 5 years in a rural Ghanaian community: An urgent call for attention. *BMC Research Notes*, *13*(1), 321. https://doi.org/10.1186/s13104-020-05199-9
2. Assemie, M. A., Ayele, T. A., Alemu, K., & Derso, A. (2021). Prevalence of intestinal parasitic infection and its associated factors among primary school students in Ethiopia: A cross-sectional study. *PLOS Neglected Tropical Diseases*, *15*(5), e0009379. https://doi.org/10.1371/journal.pntd.0009379
3. Bosch, F., Palmeirim, M. S., Ali, S. M., Ame, S. M., Hattendorf, J., Keiser, J., & Speich, B. (2021). Diagnosis of soil-transmitted helminths using the Kato-Katz technique: What is the influence of stirring, storage time and storage temperature on stool sample egg counts? *PLOS Neglected Tropical Diseases*, *15*(2), e0009032. https://doi.org/10.1371/journal.pntd.0009032
4. Demeke, G., Tsegaye, M., & Tadesse, B. (2021). Evaluation of wet mount and concentration techniques of stool examination for intestinal parasites identification at Debre Markos Comprehensive Specialized Hospital, Ethiopia. *Infection and Drug Resistance*, *14*, 1353–1362. https://doi.org/10.2147/IDR.S297746
5. Forson, A. O., Arthur, I., Ayeh-Kumi, P. F., & Kwakye-Nuako, G. (2017). Intestinal parasitic infections and risk factors: A cross-sectional survey of some school children in a suburb in Accra, Ghana. *BMC Research Notes*, *10*, 485. https://doi.org/10.1186/s13104-017-2804-7
6. Forson, A. O., Arthur, I., Olu-Taiwo, M., Glover, K. K., Pappoe-Ashong, P. J., & Ayeh-Kumi, P. F. (2017). Intestinal parasitic infections and risk factors: A cross-sectional survey of some school children in a suburb in Accra, Ghana. *BMC Research Notes*, *10*, 485. https://doi.org/10.1186/s13104-017-2802-7
7. Gebretsadik, D., Metaferia, Y., Seid, A., & Fenta, G. M. (2020). Prevalence of intestinal parasitic infection and its associated factors among school children in two primary schools in North Gondar, Northwest Ethiopia: A cross-sectional study. *Infection and Drug Resistance*, *13*, 2549–2557. https://doi.org/10.2147/IDR.S260172
8. Gebru, H., Zenebe, Y., Gebre, T., Tesfaye, G., & Deribe, K. (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. *Frontiers in Public Health, 11*. https://pmc.ncbi.nlm.nih.gov/articles/PMC10286215/

9. Girma, A., & Genet, S. (2024). Prevalence and factors associated with intestinal parasitic infections among preschool-aged children in Ethiopia: A systematic review and meta-analysis. *Parasite Epidemiology and Control, 26*, e00368.
10. Ghana Statistical Service. (2021). *2021 Population and Housing Census (PHC) – Microdata catalog.*
11. Grimes, J. E. T., Tadesse, G., Mekete, K., Wuletaw, Y., Gebretsadik, A., French, M. D., Harrison, W. E., Drake, L. J., Gardiner, I. A., Yardley, V., & Templeton, M. R. (2016). School water, sanitation, and hygiene, soil-transmitted helminths, and schistosomes: National mapping in Ethiopia. *PLOS Neglected Tropical Diseases, 10*(3), e0004515. https://doi.org/10.1371/journal.pntd.0004515
12. Hajissa, K., Zakaria, R., Suppian, R., & Mohamed, Z. (2022). Prevalence of intestinal protozoan parasites among school children in Africa: A systematic review and meta-analysis. *PLOS Neglected Tropical Diseases, 16*(2), e0009971.
13. Houweling, T. A. J., Karim-Kos, H. E., Kulik, M. C., Stolk, W. A., Haagsma, J. A., Lenk, E. J., & Vos, T. (2016). Socioeconomic inequalities in neglected tropical diseases: A systematic review. *PLOS Neglected Tropical Diseases, 10*(5), e0004546. https://doi.org/10.1371/journal.pntd.0004546
14. Khawa, S. P., Deol, R., & Kodi, M. (2021). Knowledge and practices regarding personal hygiene among primary school children. *International Journal of Community Medicine and Public Health, 8*(9).
15. Mahmud, M. A., Spigt, M., Bezabih, A. M., Pavon, I. L., Dinant, G.-J., & Velasco, R. B. (2015). Efficacy of handwashing with soap and nail clipping on intestinal parasite reinfection in school-aged children: A factorial randomized controlled trial. *PLOS Medicine, 12*(6), e1001837. https://doi.org/10.1371/journal.pmed.1001837
16. Means, A. R., van Lieshout, L., Brienen, E., Yuhas, K., Hughes, J. P., & et al. (2018). Combined effectiveness of anthelmintic chemotherapy and WASH among HIV-infected adults. *PLOS Neglected Tropical Diseases, 12*(1), e0005955. https://doi.org/10.1371/journal.pntd.0005955
17. Mehraj, V., Hatcher, J., Akhtar, S., Rafique, G., & Beg, M. A. (2008). Prevalence and factors associated with intestinal parasitic infection among children in an urban slum of Karachi. *PLOS ONE, 3*(12), e3680. https://doi.org/10.1371/journal.pone.0003680
18. Mirisho, R., Neizer, M. L., & Sarfo, B. (2017). Prevalence of intestinal helminths infestation in children attending Princess Marie Louise Children's Hospital in Accra, Ghana. *Journal of Parasitology Research, 2017*, 8524985. https://doi.org/10.1155/2017/8524985
19. Mumtaz, S., Ali, S., Ahmed, S., & Afzal, M. (2009). Frequency and risk factors for intestinal parasitic infection in children under five years of age at a tertiary care hospital in Karachi. *Journal of the Pakistan Medical Association*, *59*(4), 216–219. https://pubmed.ncbi.nlm.nih.gov/19402281/
20. **Odonkor, S. T., & Mahami, T. (2019).** Self-assessment of hygiene practices towards predictive and preventive medicine intervention: A case study of university students in Ghana. *BioMed Research International, 2019*, 1–9. https://doi.org/10.1155/2019/3868537
21. Pickering, A. J., Njenga, S. M., Steinbaum, L., Swarthout, J., Lin, A., Arnold, B. F., Stewart, C. P., Dentz, H. N., & Null, C. (2019). Effects of single and integrated water, sanitation, handwashing, and nutrition interventions on child soil-transmitted helminth and Giardia infections: A cluster-randomized controlled trial in rural Kenya. *PLOS Medicine, 16*(6), e1002841. https://doi.org/10.1371/journal.pmed.1002841
22. Seidu, A.-A., Ahinkorah, B. O., Agbaglo, E., Okyere, J., & Ameyaw, E. K. (2021). Prevalence and factors associated with hygiene behaviours among in-school adolescents in Ghana. *AIMS Public Health, 8*(2), 324–337. https://doi.org/10.3934/publichealth.2021026
23. Smith, J., et al. (2020). Urban vs. rural differences in parasite prevalence. *Tropical Medicine & International Health*, 25(5), 509–519.
24. Walana, W., Tay, S. C. K., Tetteh, P., & Ziem, J. B. (2014). Prevalence of intestinal protozoan infestation among primary school children in urban and peri-urban communities in Kumasi, Ghana. *Science Journal of Public Health, 2*(2), 52–57. https://doi.org/10.11648/j.sjph.20140202.12
25. World Health Organization. (n.d.). *Soil-transmitted helminthiases: Control strategy.*
26. World Health Organization. (2023, January 18). *Soil-transmitted helminth infections.*
27. Yadav, K., & Prakash, S. (2016). Study on intestinal parasitic infections in Muslim community of Janakpurdham, Nepal. *Janaki Medical College Journal of Medical Science, 4*(1), 36–45. https://doi.org/10.3126/jmcjms.v4i1.16383
28. Anno, E. F. & Nakeno, D. L. (2026). REGIONAL INTEGRATION PROVISIONS FOR EFFICACY OF CROSS-BORDER TRADE: ENHANCING LIVESTOCK MARKETING ACTIVITIES IN TRADE CORRIDORS IN THE TURKANA, KARAMOJA, EASTERN EQUATORIA, AND SOUTH OMO REGIONS. IRASS Journal of Multidisciplinary Studies, 3(1),11-21.
29. Lopez, A. R., Kwakye, S. A., Amponsah, E., Louisa, B. & Hanyabui, B. (2026). Studies on Kidney Function and Lipid Profile among Type 2 Diabetic Patients Attending Tetteh Quarshie Memorial Hospital. IRASS Journal of Multidisciplinary Studies, 3(1),22-34
30. Lopez, A. R., Lamptey, A., Addae, M. M. & Achiampong, A. A. (2026). Evaluating Diagnostic Methods for Transfusion-Transmitted Malaria: RDT vs. Microscopy in Blood Donation Screening. IRASS Journal of Multidisciplinary Studies, 3(1),35-44.
31. Lopez, A. R., Agyei, B. A., Budu, R. & Achiampong, A. A. (2026). Prostate Health Risks among Taxi Drivers in Ghana: Prevalence of Elevated PSA Levels, Awareness, and Screening Barriers. IRASS Journal of Multidisciplinary Studies, 3(1),45-61.

32. Lopez, A. R., Tuffour, O. A. A. D. (2026). Socio-demographic and Lifestyle Factors Associated with Diabetic Nephropathy among Adults with Type 2 Diabetes Mellitus in Ghana. IRASS Journal of Multidisciplinary Studies, 3(1),62-75.
33. Lopez, A. R., Amofoa, E., Arthur, S., Manteaw, S. & Awonjaa, M. (2026). Prevalence and Risk Factors of Pulmonary Tuberculosis among Presumptive TB Patients at Akim Oda Government Hospital, Ghana: A Cross-Sectional Study. IRASS Journal of Multidisciplinary Studies, 3(1),76-88.