# TITLE PAGE

**A STUDY ON THE PREVALENCE OF INTESTINAL PARASITES FOUND IN PUPILS ATTENDING FOUR (4) SELECTED PRIMARY SCHOOLS IN MARARABA MUBI, HONG, ADAMAWA STATE**

**BY**

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**ST/EB/HND/21/012**

**A PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF CHEMICAL SCIENCE TECHNOLOGY, FEDERAL POLYTECHNIC MUBI, ADAMAWA STATE**

**IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF HIGHER NATIONAL DIPLOMA (HND) IN SCIENCE LABORATORY TECHNOLOGY (ENVIRONMENTAL BIOLOGY) OPTION**

**OCTOBER, 2023**

# DECLARATION

I **(Alheri John)** with the registration number **(ST/EB/HND/21/012)** hereby declare that this work is the product of my own research effort, undertaken under the supervision of **(Chief Demshemino PH Moses)** and has not been presented elsewhere for the award of any certificate. All sources of information have been duly distinguished and appropriately acknowledged.

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Alheri John Date

ST/EB/HND/21/012

# CERTIFICATION

This is to certify that this project: **(A Study on the Prevalence of Intestinal Parasites Found in Pupils Attending Four (4) Selected Primary Schools In Mararaba Mubi, Hong, Adamawa State)** was done by **(Alheri John)** with Registration Number **ST/EB/HND/21/012** an defend during the 2022/2023 academic season in the department of Biological Science and Technology Federal Polytechnic Mubi. The work was examined and found to meet the requirement governing the award of Higher National Diploma (HND) of the Federal polytechnic Mubi and it’s approved for its contribution to knowledge and literacy presentation.

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Chief Demshemino PH Moses Date

(Project Supervisor)

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Chief Demshemino PH Moses Date

(Head of Department)

…………………………… …………………

(External Supervisor Date

# DEDICATION

This project is dedicated to Almighty God for given me the wisdom, strength, knowledge, zeal, courage, guidance, protection and aspiration to accomplish this research work. To God be the glory.

# ACKNOWLEDGEMENTS

I wish to express my profound gratitude to God almighty for given me the strength and the ability to make this great task possible.

My sincere gratitude goes to my project supervisor Chief Demshemino PH Moses, the Head of Department Chief Demshemino PH Moses and the project committees who tirelessly work to ensure the correct from and content of the research work, may the almighty God reward all in abundance.

I wish to express my profound gratitude to the entire staff of the department of Biological Science for their coordinating ability and working round the clock for a successful completion of our studies and this project work.

My special thanks go to my beloved parents Mr. and Mrs. John S. Dauda also my special greeting goes to my beloved brother and my lovely sister for their, prayers, and financial support throughout my studies, may the almighty God continue to bless you all Amen.

Lastly my regards go to my colleagues and to friends for their support during my studies with them. May the Almighty God grant them their heart desire. Amen.

# TABLE OF CONTENTS

[TITLE PAGE i](#_Toc146914178)

[DECLARATION ii](#_Toc146914179)

[CERTIFICATION iii](#_Toc146914180)

[DEDICATION iv](#_Toc146914181)

[ACKNOWLEDGEMENTS v](#_Toc146914182)

[TABLE OF CONTENTS vi](#_Toc146914183)

[ABSTRACT viii](#_Toc146914184)

[CHAPTER ONE 1](#_Toc146914185)

[INTRODUCTION 1](#_Toc146914186)

[1.1 Background of the Study 1](#_Toc146914187)

[1.2 Statement of the Problem 2](#_Toc146914188)

[1.3 Aim and Objectives 3](#_Toc146914189)

[1.4 Significance of the Study 3](#_Toc146914190)

[CHAPTER TWO 4](#_Toc146914191)

[LITERATURE REVIEW 4](#_Toc146914192)

[2.1 Intestinal Parasite 4](#_Toc146914193)

[2.2.3 Flukes (Trematodes) 9](#_Toc146914194)

[2.2.4 Tapeworms (Cestodes) 12](#_Toc146914195)

[2.2.5 Roundworms (Nematodes) 13](#_Toc146914196)

[CHAPTER THREE 16](#_Toc146914197)

[MATERIAL AND METHOD 16](#_Toc146914198)

[3.1 Study Area 16](#_Toc146914199)

[3.2 Study Site 16](#_Toc146914200)

[3.3 Study Population 16](#_Toc146914201)

[3.4 Sample collection 17](#_Toc146914202)

[3.5 Method of Analysis 17](#_Toc146914203)

[3.6 Data Analysis 17](#_Toc146914204)

[CHAPTER FOUR 18](#_Toc146914205)

[4.1 Results 18](#_Toc146914206)

[CHAPTER FIVE 21](#_Toc146914207)

[DISCUSSION, CONCLUSION AND RECOMMENDATIONS 21](#_Toc146914208)

[5.1 Discussion 21](#_Toc146914209)

[5.2 Conclusion 21](#_Toc146914210)

[5.3 Recommendations 22](#_Toc146914211)

[REFERENCES 24](#_Toc146914212)

# ABSTRACT

*Intestinal parasites pose a significant public health challenge, particularly in developing regions like Mararaba Mubi, Hong, Adamawa State. This study is aimed at investigating the prevalence of intestinal parasites among pupils attending four primary schools in Mararaba Mubi and providing insights into the distribution of these parasites by location, age, gender, and specific species. The findings revealed varying prevalence rates among the selected primary schools, with school KA exhibiting the highest prevalence (70%) and DS the lowest (50%). The overall prevalence for all schools combined was 59.2%. Age-wise analysis indicated that older pupils (10-12 age group) were more susceptible, with a prevalence rate of 50.7%, while the youngest (4-6 age group) showed the lowest prevalence at 11.2%. Gender-based analysis showed nearly equal prevalence among male (60%) and female (58.3%) pupils. Furthermore, the study examined the prevalence of specific parasite species (E. histolytica, Hookworm, E. coli, A. lumbricoides) across the four schools, highlighting variations in parasite species distribution. In conclusion, this study underscores the need for comprehensive interventions, including health education, routine screening, deworming programs, sanitation improvements, and community involvement, to combat the prevalence of intestinal parasites among school pupils in Mararaba Mubi, Hong, Adamawa State. These findings serve as a foundation for targeted public health initiatives aimed at improving the well-being of pupils and the overall health of the community.*

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of the Study

Intestinal parasitic infections pose a significant burden on public health worldwide, particularly in regions characterized by poverty, inadequate sanitation, and limited access to clean water sources (Pullan *et al.,* 2014). These infections are caused by a variety of parasitic worms, such as *Ascaris lumbricoides, Trichuris trichiura,* and *hookworms*, as well as protozoa including *Giardia lamblia* and *Entamoeba histolytica* (Hotez *et al*., 2008). The transmission of these parasites occurs predominantly through the ingestion of parasite eggs or larvae present in contaminated soil, water, or food (Hotez *et al.,* 2009).

Among the vulnerable population groups affected by intestinal parasitic infections, school-age children, especially pupils, bear a significant burden. The World Health Organization (WHO) estimates that over 270 million school-age children are infected with soil-transmitted helminths, a group of intestinal parasites, globally (WHO, 2020). These infections impaire children's physical development, nutritional status, and cognitive functioning, ultimately affecting their overall health and educational outcomes (Nematian *et al*., 2004).

The prevalence of intestinal parasitic infections among pupils is influenced by various factors. In regions with inadequate sanitation facilities and poor hygiene practices, such as open defecation and limited access to clean water, the risk of infection increases substantially (Brooker et al., 2006). Furthermore, socioeconomic factors, including poverty, overcrowding, and low parental education levels, contribute to the persistence of these infections (Hotez *et al.,* 2009).

The consequences of intestinal parasitic infections in pupils extend beyond physical health. Malnutrition is a common outcome of these infections, as parasites compete for nutrients and impair nutrient absorption in the gastrointestinal tract (Stephenson *et al.,* 2020). Chronic infections can lead to stunted growth, micronutrient deficiencies, and anemia, negatively impacting children's overall well-being and cognitive development (Stoltzfus *et al*., 2014).

In the educational context, intestinal parasitic infections present significant challenges. Infected pupils may experience frequent absenteeism due to illness, leading to educational disruption and hindered academic progress (Brooker *et al.,* 2007). The physical symptoms associated with these infections, such as fatigue, abdominal pain, and diarrhea, can impair concentration and cognitive functioning, affecting learning outcomes (Hesham *et al*., 2014). Additionally, the social stigma attached to these infections may affect pupils' self-esteem and social interactions within the school environment (Albonico *et al.,* 2008).

To address the prevalence and impact of intestinal parasitic infections among pupils, localized studies are essential. Prevalence rates and species distribution vary across different geographical regions due to environmental, socio-economic, and cultural factors (Pullan *et al.,* 2014). Therefore, understanding the specific context and characteristics of intestinal parasitic infections in a given population is crucial for designing targeted intervention strategies and implementing effective preventive measures.

## 1.2 Statement of the Problem

Despite efforts to improve public health and sanitation conditions, intestinal parasitic infections remain a major health concern, especially among school-age children. Pupils are particularly susceptible to these infections due to their close contact with contaminated soil and water sources, inadequate hand hygiene practices, and limited knowledge about preventive measures. The prevalence of intestinal parasites in pupils can have serious consequences, including malnutrition, impaired growth, anemia, and reduced educational performance. Therefore, understanding the extent of the problem and identifying the specific parasite species prevalent in this population is essential for effective intervention strategies and improved health outcomes.

This study aims to determine the prevalence of intestinal parasites among pupils in four (4) selected primary school in Hong Local Government Area of Adamawa State. By identifying the specific parasite species and exploring associated factors, such as demographic and socio-economic variables, hygiene practices, and nutritional status, the study seeks to contribute to the existing knowledge on the burden of intestinal parasitic infections in this vulnerable population group. The findings will provide valuable insights for policymakers, educators, and public health professionals to develop evidence-based interventions that improve the health, well-being, and educational outcomes of pupils affected by intestinal parasitic infections.

## 1.3 Aim and Objectives

The aim of this study is to determine the prevalence of intestinal parasites among pupils in the study area. The specific objectives include:

1. To assess the prevalence of intestinal parasites in school pupils in the study area.
2. To determine if infection is related to age.
3. To evaluate if infection is related to sex.
4. To ascertain if infection is related to parasite species.

## 1.4 Significance of the Study

This study will provide up-to-date information on the prevalence of intestinal parasites among pupils in the study area. The study will provide knowledge on the prevalence of intestinal parasites found in the study area. The findings can be used to create awareness among residents of the study area, policymakers, educators, and parents about the need of preventive measures and improve sanitation facilities in schools. Additionally, the study will identify the specific parasite species prevalent in the area, enabling targeted intervention strategies and appropriate treatment protocols to be developed.

**1.5 Scope of the study**

This study will focus on the prevalence of parasite in the study area.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Intestinal Parasite

Parasitic infections, caused by intestinal helminths and protozoan parasites, are among the most prevalent infections in humans in developing countries. In developed countries, protozoan parasites more commonly cause gastrointestinal infections compared to helminths. Intestinal parasites cause a significant morbidity and mortality in endemic countries.

Helminths are worms with many cells. Nematodes (roundworms), cestodes (tapeworms), and trematodes (flatworms) are among the most common helminths that inhabit the human gut. Usually, helminths cannot multiply in the human body. Protozoan parasites that have only one cell can multiply inside the human body. There are four species of intestinal helminthic parasites, also known as geohelminths and soil-transmitted helminths: Ascaris lumbricoides (roundworm), Trichiuris trichiuria (whipworm), Ancylostoma duodenale, and Necator americanicus (hookworms). These infections are most prevalent in tropical and subtropical regions of the developing world where adequate water and sanitation facilities are lacking (Saviola, 2014). Recent estimates suggest that A. lumbricoides can infect over a billion, T. trichiura 795 million, and hookworms 740 million people (Stoltzfus *et al.*, 2014). Other species of intestinal helminths are not widely prevalent. Intestinal helminths rarely cause death. Instead, the burden of disease is related to less mortality than to the chronic and insidious effects on health and nutritional status of the host (Stephenson *et al.,* 2020). In addition to their health effects, intestinal helminth infections also impair physical and mental growth of children, thwart educational achievement, and hinder economic development (Okhuysen, 2019).

An intestinal parasite infection is a condition in which a [parasite](https://en.wikipedia.org/wiki/Parasite) infects the [gastro-intestinal tract](https://en.wikipedia.org/wiki/Gastro-intestinal_tract) of humans and other animals. Such parasites can live anywhere in the body, but most prefer the intestinal wall. Routes of exposure and infection include ingestion of undercooked meat, drinking infected water, [fecal-oral transmission](https://en.wikipedia.org/wiki/Fecal-oral_transmission" \o "Fecal-oral transmission) and skin absorption. Some types of [helminths](https://en.wikipedia.org/wiki/Helminths) and [protozoa](https://en.wikipedia.org/wiki/Protozoa) are classified as intestinal parasites that cause infection—those that reside in the [intestines](https://en.wikipedia.org/wiki/Intestines). These infections can damage or sicken the host (humans or other animals). If the intestinal parasite infection is caused by helminths, the infection is called [helminthiasis](https://en.wikipedia.org/wiki/Helminthiasis) (Guyatt, 2020).

Signs and symptoms depend on the type of infection. Intestinal parasites produce a variety of symptoms in those affected, most of which manifest themselves in gastrointestinal complications and general weakness. Gastrointestinal conditions include [inflammation](https://en.wikipedia.org/wiki/Inflammation) of the [small](https://en.wikipedia.org/wiki/Enteritis) and/or [large intestine](https://en.wikipedia.org/wiki/Colitis), [diarrhea](https://en.wikipedia.org/wiki/Diarrhea" \o "Diarrhea)/[dysentery](https://en.wikipedia.org/wiki/Dysentery), [abdominal pains](https://en.wikipedia.org/wiki/Abdominal_pain), and [nausea](https://en.wikipedia.org/wiki/Nausea)/[vomiting](https://en.wikipedia.org/wiki/Vomiting). These symptoms negatively impact nutritional status, including decreased absorption of [micronutrients](https://en.wikipedia.org/wiki/Micronutrient), loss of appetite, weight loss, and intestinal blood loss that can often result in [anemia](https://en.wikipedia.org/wiki/Anemia" \o "Anemia). It may also cause physical and mental disabilities, [delayed growth](https://en.wikipedia.org/wiki/Delayed_growth) in children, and skin irritation around the anus and vulva (Davis *et al.*, 2022).

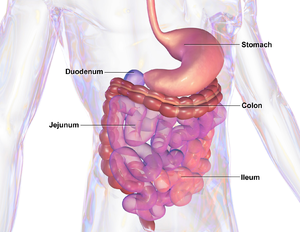


Figure 2.1: Human gastro-intestinal system

The most common intestinal protozoan parasites are: Giardia intestinalis, Entamoeba histolytica, Cyclospora cayetanenensis, and Cryptosporidium spp. The diseases caused by these intestinal protozoan parasites are known as giardiasis, amoebiasis, cyclosporiasis, and cryptosporidiosis respectively, and they are associated with diarrhoea (Petri *et al.*, 2020). G. intestinalis is the most prevalent parasitic cause of diarrhoea in the developed world, and this infection is also very common in developing countries. Amoebiasis is the third leading cause of death from parasitic diseases worldwide, with its greatest impact on the people of developing countries.

In an article published in this issue of the Journal, Jacobsen et al. looked at the prevalence of intestinal parasites in young Quichua children in the highland or rural Ecuador (Jacobsen *et al.,* 2017). They have found a high prevalence of intestinal parasites, especially the intestinal protozoan parasites. They have used the traditional microscopic technique to diagnose intestinal parasitic infections. In total, 203 stool samples were examined from children aged 12-60 months and found that 85.7% of them had at least on parasite. The overall prevalence of intestinal protozoan parasites were: E. histolytica/E. dispar 57.1%, Escherichia coli 34.0%, G. intestinalis 21.1%, C. parvum 8.9%, and C. mesnili 1.7%, while the prevalence of intestinal helminthic parasites in this study were: A. lumbricoides 35.5%, T. trichiura 0.5 %, H. diminuta 1.0%, and S. stercoralis 0.7%. A recent study in Nicaragua in asymptomatic individuals found that 12.1% (58/480) were positive for E. histolytica/E. dispar by microscopy, but E. histolytica and E. disapr were positive by polymerase chain reaction (PCR) only in three and four stool samples respectively among the microscopic positive samples (Unpublished data). This study proves again that the diagnosis of E. histolytica/E. dispar is neither sensitive nor specific when it is done by microscopy. To understand the real prevalence of E. histolytica-associated infection, a molecular method must be used for its diagnosis (Silva *et al.,* 2015).

Soil-transmitted helminth infections are invariably more prevalent in the poorest sections of the populations in endemic areas of developing countries. The goal is to reduce morbidity from soil-transmitted helminth infections to such levels that these infections are no longer of public-health importance. An additional goal is to improve the developmental, functional and intellectual capacity of affected children (Haque *et al.,* 2021). Highly-effective, safe single-dose drugs, such as albendazole, now available, can be dispensed through healthcare services, school health programmes, and community interventions directed at vulnerable groups. As these infections are endemic in poor communities, more permanent control will only be feasible where chemotherapy is supplemented by improved water supplies and sanitation, strengthened by sanitation education. In the long term, this type of permanent transmission control will only be possible with improved living conditions through economic development. Intestinal protozoa multiply rapidly in their hosts, and as there is a lack of effective vaccines, chemotherapy has been the only practised way to treat individuals and reduce transmission. The current treatment modalities for intestinal protozoan parasites include metronidazole, iodoquinol, diloxanide furoate, paromomycin, chloroquine, and trimethoprim-sulphamethoxazole. Nitazoxanide, a broad-spectrum anti-parasitic agent, was reported to be better than placebo for the treatment of cryptosporidiosis in a double-blind study performed in Mexico. Genomes of these three important protozoan parasites have already been published, and studies are underway to understand protective immunity to these protozoan parasites to develop vaccines for them (Leiva *et al.,*2016).

## 2.2 Classification of Intestinal Parasite

**2.2.1 Protozoa**

Protozoa are single-celled eukaryotic microorganisms that can infect the human gastrointestinal tract, leading to a variety of illnesses. Recent research has provided valuable insights into the classification, epidemiology, and clinical impact of protozoan intestinal parasites.

**Entamoeba histolytica:** Entamoeba histolytica is a pathogenic amoeba responsible for amoebic dysentery and amoebic liver abscess. Recent research has focused on improving diagnostic methods, such as PCR-based techniques and antigen detection, to distinguish E. histolytica from non-pathogenic Entamoeba species. Furthermore, studies have explored potential drug targets for the treatment of amoebiasis (Petri & Singh, 2019).

**Giardia lamblia:** Giardia lamblia, the causative agent of giardiasis, remains a common waterborne parasite with global significance. Recent research has highlighted the importance of molecular epidemiology in tracking the sources of Giardia infections, particularly in outbreaks. Additionally, studies have focused on drug resistance and the development of new treatment strategies for giardiasis (Savioli *et al.,* 2006).

**Cryptosporidium spp.:** Cryptosporidium spp. are protozoan parasites responsible for cryptosporidiosis, a diarrheal disease with a significant impact on public health, especially in immunocompromised individuals. Recent research has focused on improving diagnostics, such as the development of molecular methods and antigen-based tests. The search for effective treatments and vaccine candidates against Cryptosporidium has also been an area of active investigation. Recent research has expanded our knowledge of other protozoan intestinal parasites, including Entamoeba coli, Dientamoeba fragilis, and Balantidium coli. While these parasites are generally considered non-pathogenic, some studies have indicated potential associations with gastrointestinal symptoms, prompting further investigation into their clinical significance (Checkley *et al.,* 2015).

**2.2.2 Helminths (Worms)**

Helminth is a general term meaning worm. The helminths are invertebrates characterized by elongated, flat or round bodies. In medically oriented schemes the flatworms or platyhelminths (platy from the Greek root meaning “flat”) include flukes and tapeworms. Roundworms are nematodes (nemato from the Greek root meaning “thread”). These groups are subdivided for convenience according to the host organ in which they reside, e.g., lung flukes, extraintestinal tapeworms, and intestinal roundworms. This chapter deals with the structure and development of the three major groups of helminths (Roy *et al.,* 2005).

Helminths develop through egg, larval (juvenile), and adult stages. Knowledge of the different stages in relation to their growth and development is the basis for understanding the epidemiology and pathogenesis of helminth diseases, as well as for the diagnosis and treatment of patients harboring these parasites (Leo *et al.,* 2006).

Platyhelminths and nematodes that infect humans have similar anatomic features that reflect common physiologic requirements and functions. The outer covering of helminths is the cuticle or tegument. Prominent external structures of flukes and cestodes are acetabula (suckers) or bothria (false suckers). Male nematodes of several species possess accessory sex organs that are external modifications of the cuticle. Internally, the alimentary, excretory, and reproductive systems can be identified by an experienced observer. Tapeworms are unique in lacking an alimentary canal. This lack means that nutrients must be absorbed through the tegument. The blood flukes and nematodes are bisexual. All other flukes and tapeworm species that infect humans are hermaphroditic. With few exceptions, adult flukes, cestodes, and nematodes produce eggs that are passed in excretions or secretions of the host. The various stages and their unique characteristics will be reviewed in more detail as each major group of helminths is considered (Haque *et al.,* 2019).

## 2.2.3 Flukes (Trematodes)

The structure of flukes is summarized in Figure 2.2 below. A dorsoventrally flattened body, bilateral symmetry, and a definite anterior end are features of platyhelminths in general and of trematodes specifically. Flukes are leaf-shaped, ranging in length from a few millimeters to 7 to 8 cm. The tegument is morphologically and physiologically complex. Flukes possess an oral sucker around the mouth and a ventral sucker or acetabulum that can be used to adhere to host tissues. A body cavity is lacking. Organs are embedded in specialized connective tissue or parenchyma. Layers of somatic muscle permeate the parenchyma and attach to the tegument (Haque *et al.,* 2019).

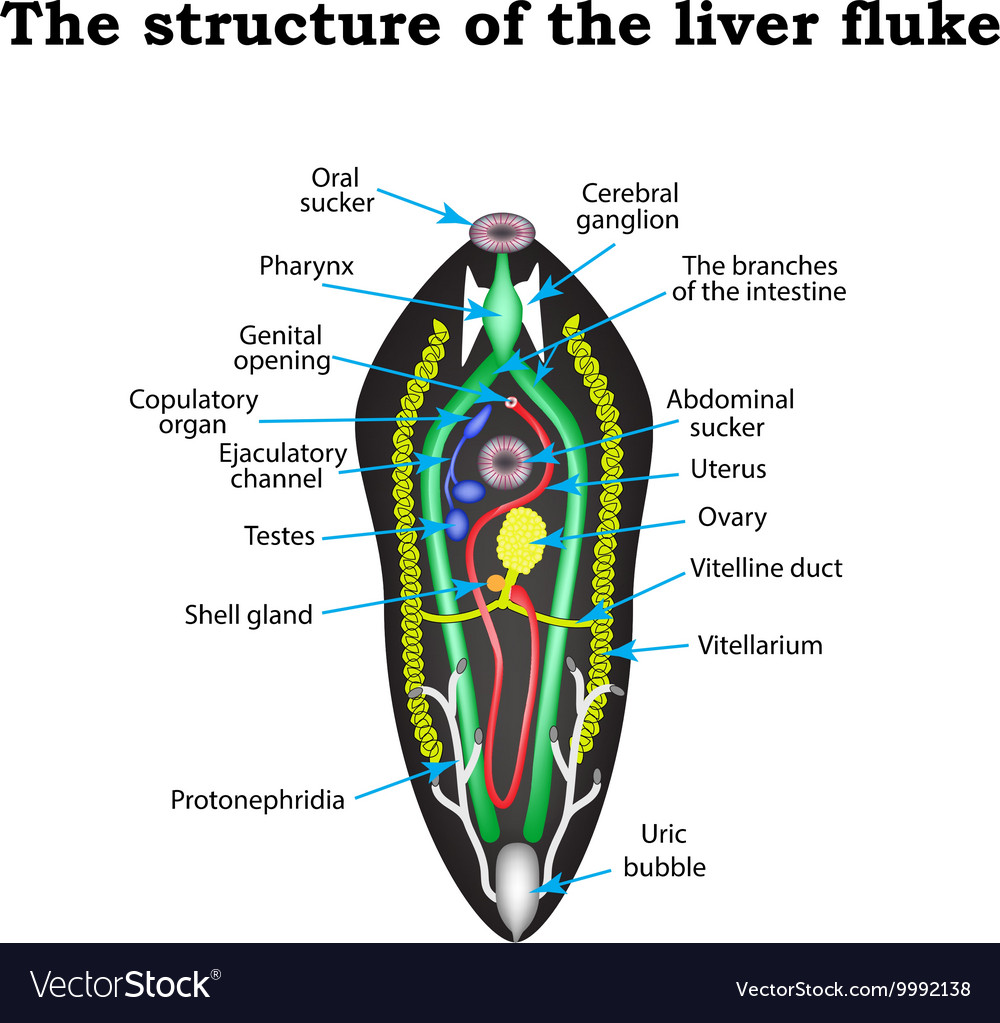


Figure 2.2: Structure of fluke

Flukes have a well-developed alimentary canal with a muscular pharynx and esophagus. The intestine is usually a branched tube (secondary and tertiary branches may be present) consisting of a single layer of epithelial cells. The main branches may end blindly or open into an excretory vesicle. The excretory vesicle also accepts the two main lateral collecting ducts of the excretory system, which is of a protonephridial type with flame cells. A flame cell is a hollow, terminal excretory cell that contains a beating (flamelike) group of cilia. These cells, anchored in the parenchyma, direct tissue filtrate through canals into the two main collecting ducts (Weitzel *et al.,* 2006).

Except for the blood flukes, trematodes are hermaphroditic, having both male and female reproductive organs in the same individual. The male organ consists usually of two testes with accessory glands and ducts leading to a cirrus, or penis equivalent, that extends into the common genital atrium. The female gonad consists of a single ovary with a seminal receptacle and vitellaria, or yolk glands, that connect with the oviduct as it expands into an ootype. The tubular uterus extends from the ootype and opens into the genital atrium. Both self- and cross-fertilization occur. The components of the egg are assembled in the ootype. Eggs pass through the uterus into the genital atrium and exit ventrally through the genital pore. Fluke eggs, except for those of schistosomes, are operculated (have a lid) (Roy, 2005).

The blood flukes or schistosomes are the only bisexual flukes that infect humans. Although the sexes are separate, the general body structure is the same as that of hermaphroditic flukes. Within the definitive host, the male and female worms inhabit the lumen of blood vessels and are found in close physical association. The female lies within a tegumental fold, the gynecophoral canal, on the ventral surface of the male. The medically important flukes belong to the taxonomic category Digenea. This group of flukes has a developmental cycle requiring at least two hosts, one being a snail intermediate host. Depending on the species, other intermediate hosts may be involved to perpetuate the larval form that infects the definitive human host (Garcia et al., 2017).

Flukes go through several larval stages, each with a specific name, before reaching adulthood. Taking into account variations among species, a generalized life cycle of digenetic flukes runs the following course. Eggs are passed in the feces, urine, or sputum of humans and reach an aquatic environment. The eggs hatch, releasing ciliated larvae, or miracidia, which either penetrate or are eaten by a snail intermediate host. In rare instances land snails may serve as intermediate hosts. A saclike sporocyst or redia stage develops from a miracidium within the tissues of the snail. The sporocyst gives rise either to rediae or to a daughter sporocyst stage. In turn, from the redia or daughter sporocyst, cercariae develop asexually and migrate out of the snail tissues to the external environment, which is usually aquatic. The cercariae, which may possess a tail for swimming, develop further in one of three ways. They either penetrate the definitive host and transform directly into adults, or penetrate a second intermediate host and develop as encysted metacercariae, or they encyst on a substrate, such as vegetation, and develop there as metacercariae. When a metacercarial cyst is ingested, digestion of the cyst liberates an immature fluke that migrates to a specific organ site and develops into an adult worm (Chalmers *et al.,* 2015).

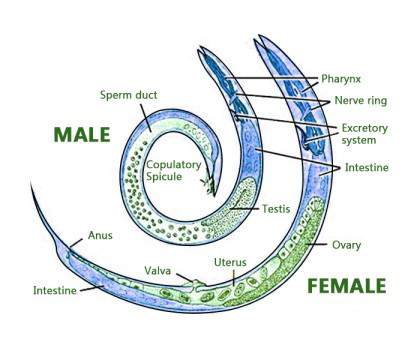
## 2.2.4 Tapeworms (Cestodes)

As members of the platyhelminths, the cestodes, or tapeworms, possess many basic structural characteristics of flukes, but also show striking differences.  Anatomically, cestodes are divided into a scolex, or head, which bears the organs of attachment, a neck that is the region of segment proliferation, and a chain of proglottids called the strobila. The strobila elongates as new proglottids form in the neck region. The segments nearest the neck are immature (sex organs not fully developed) and those more posterior are mature. The terminal segments are gravid, with the egg-filled uterus as the most prominent feature (Matos *et al.,* 2014).

The scolex contains the cephalic ganglion, or “brain,” of the tapeworm nervous system. Externally, the scolex is characterized by holdfast organs. Depending on the species, these organs consist of a rostellum, bothria, or acetabula. A rostellum is a retractable, conelike structure that is located on the anterior end of the scolex, and in some species is armed with hooks. Bothria are long, narrow, weakly muscular grooves that are characteristic of the pseudophyllidean tapeworms. Acetabula (suckers like those of digenetic trematodes) are characteristic of cyclophyllidean tapeworms (Zhu *et al.,* 2018).

## 2.2.5 Roundworms (Nematodes)

In contrast to platyhelminths, nematodes are cylindrical rather than flattened; hence the common name roundworm. The body wall is composed of an outer cuticle that has a noncellular, chemically complex structure, a thin hypodermis, and musculature. The cuticle in some species has longitudinal ridges called alae. The bursa, a flaplike extension of the cuticle on the posterior end of some species of male nematodes, is used to grasp the female during copulation (Stroup *et al.,* 2016).



*Figure 2.3: Structure of nematodes.*

The cellular hypodermis bulges into the body cavity or pseudocoelom to form four longitudinal cords—a dorsal, a ventral, and two lateral cords—which may be seen on the surface as lateral lines. Nuclei of the hypodermis are located in the region of the cords. The somatic musculature lying beneath the hypodermis is a single layer of smooth muscle cells. When viewed in cross-section, this layer can be seen to be separated into four zones by the hypodermal cords. The musculature is innervated by extensions of muscle cells to nerve trunks running anteriorly and posteriorly from ganglion cells that ring the midportion of the esophagus (Regnath *et al.,* 2016).

The space between the muscle layer and viscera is the pseudocoelom, which lacks a mesothelium lining. This cavity contains fluid and two to six fixed cells (celomocytes) which are usually associated with the longitudinal cords. The function of these cells is unknown. The alimentary canal of roundworms is complete, with both mouth and anus. The mouth is surrounded by lips bearing sensory papillae (bristles). The esophagus, a conspicuous feature of nematodes, is a muscular structure that pumps food into the intestine; it differs in shape in different species. The intestine is a tubular structure composed of a single layer of columnar cells possessing prominent microvilli on their luminal surface (Petri *et al.*, 2020).

The excretory system of some nematodes consists of an excretory gland and a pore located ventrally in the mid-esophageal region. In other nematodes this structure is drawn into extensions that give rise to the more complex tubular excretory system, which is usually H-shaped, with two anterior limbs and two posterior limbs located in the lateral cords. The gland cells and tubes are thought to serve as absorptive bodies, collecting wastes from the pseudocoelom, and to function in osmoregulation (Stoltzfus *et al.*, 2014).

Nematodes are usually bisexual. Males are usually smaller than females, have a curved posterior end, and possess (in some species) copulatory structures, such as spicules (usually two), a bursa, or both. The males have one or (in a few cases) two testes, which lie at the free end of a convoluted or recurved tube leading into a seminal vesicle and eventually into the cloaca (Drake *et al.,* 2020).

The female system is tubular also, and usually is made up of reflexed ovaries. Each ovary is continuous, with an oviduct and tubular uterus. The uteri join to form the vagina, which in turn opens to the exterior through the vulva. Copulation between a female and a male nematode is necessary for fertilization except in the genus *Strongyloides,* in which parthenogenetic development occurs (i.e., the development of an unfertilized egg into a new individual). Some evidence indicates that sex attractants (pheromones) play a role in heterosexual mating. During copulation, sperm is transferred into the vulva of the female. The sperm enters the ovum and a fertilization membrane is secreted by the zygote. This membrane gradually thickens to form the chitinous shell. A second membrane, below the shell, makes the egg impervious to essentially all substances except carbon dioxide and oxygen. In some species, a third proteinaceous membrane is secreted as the egg passes down the uterus by the uterine wall and is deposited outside the shell. Most nematodes that are parasitic in humans lay eggs that, when voided, contain either an uncleaved zygote, a group of blastomeres, or a completely formed larva. Some nematodes, such as the filariae and *Trichinella spiralis*, produce larvae that are deposited in host tissues. The developmental process in nematodes involves egg, larval, and adult stages. Each of four larval stages is followed by a molt in which the cuticle is shed. The larvae are called second-stage larvae after the first molt, and so on. The nematode formed at the fifth stage is the adult (Hewaldt, 2019).

# CHAPTER THREE

# MATERIAL AND METHOD

## 3.1 Study Area

Hong Local Government Area (LGA) is selected as the study area for several reasons. Hong Local Government Area is located in Adamawa State, Nigeria, and is characterized by its diverse population and geographical features. It is situated in the North Eastern part of the country, known for its unique socio-cultural dynamics and health challenges. Hong LGA covers a significant land area and is home to a substantial population, making it a suitable representation of the region. The LGA consists of both rural and urban communities, providing a diverse range of settings for the study. This diversity allows for a comprehensive understanding of the prevalence of intestinal parasites in different environments, including rural villages and urban areas.

## 3.2 Study Site

The primary schools in Mararaba Mubi, Hong LGA was chosen as the study sites due to their accessibility and the availability of a large number of pupils within the target age group. The selection of primary schools will be done using a random sampling technique to ensure that the study population will be representative of the pupils attending schools in the Mararaba Mubi, Hong LGA is characterized by a mix of socio-economic backgrounds, ranging from low-income households to more affluent communities. This diversity in socio-economic status provides an opportunity to explore potential associations between economic factors and the prevalence of intestinal parasites among the pupils.

## 3.3 Study Population

A total of 120 stool samples from four (4) selected schools were collected.

## 3.4 Sample collection

Prior to the commencement of the study, the schools were visited and permission sought from the school authority.

The samples were collected from four primary schools prior to the collection of the data the researcher met with the authority of the schools to obtain permission. Samples were collected from one hundred and twenty (120) children of age ranging from 4-12 years. The names of schools, locations, age and sex of the pupils was recorded. The samples were transported to Federal Polytechnic, Mubi Laboratory for analysis.

## 3.5 Method of Analysis

In the laboratory the samples were screened using Formalin-ether concentration method.

1. Collection of Stool Sample.
2. Sample Preparation.
3. Fixation.
4. Homogenization.
5. Filtration.
6. Sedimentation.
7. Decantation.
8. Ether Addition.
9. Mixing.
10. Centrifugation.
11. Observation.

The results obtained were recorded

## 3.6 Data Analysis

Data obtained from the study was analysed using tables and sample percentages.

# CHAPTER FOUR

# RESULTS

Table 1: Prevalence of parasites in the four primary school based on location

|  |  |  |  |
| --- | --- | --- | --- |
| **School** | **No Examined** | **No Infected** | **Percentage of infected (%)** |
| BA | 30 | 18 | 60 |
| DS | 30 | 15 | 50 |
| KA | 30 | 21 | 70 |
| KB | 30 | 17 | 56.6 |
| **Total** | **120** | **71** | **59.2%** |

Source: field survey, 2022

Key: BA = Brain Trust Academy, DS = Dominion Stars Academy, KA = Kwarhi A primary school and KB = Kwarhi B primary school.

From Table 1 above it was observed that, Kwarhi A primary school (KA), had the highest prevalence 21(70%), it was followed by Brain Trust Academy (BA), 18(60%) Kwarhi B primary school (KB), had 17(56%) while, Dominion stars academy (DS), had the least 15(50%).

Table 2: Prevalence of intestinal parasites among the pupils based on age

|  |  |  |  |
| --- | --- | --- | --- |
| **Age** | **No Examined** | **No Infected** | **Percentage of infected (%)** |
| 4-6 | 41 | 8 | 11.2 |
| 7-9 | 33 | 16 | 22.6 |
| 10-12 | 40 | 36 | 50.7 |
| 13 and above | 6 | 11 | 15.6 |
| **Total** | **120** | **71** | **59.6%** |

Source: field survey, 2022

From Table 2 above shows the age analysis of the pupils, it was observed that 36(50%) of the pupils who are between the ages of 10-12 were infected with intestinal parasites, followed by age 7- 9 years old representing 16(22%) of pupils, 13 and above years had 11(15%) while, the least affected were the age between 4 – 6 years 8(11%) of the population.

Table 3: Prevalence of intestinal parasites in school pupils based on sex

|  |  |  |  |
| --- | --- | --- | --- |
| **Sex** | **No. Examined** | **No. infected** | **Percentage of infected (%)** |
| Male | 60 | 36 | 60 |
| Female | 60 | 35 | 58.3 |
| Total | 120 | 71 | 28.3 |

Source: field survey, 2022

From Table 3 it shows that 36(60%) of the infected pupils sampled were male while 35(58%) were females.

Table 4: Prevalence of parasites among the pupils in the study area based on parasites species

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parasites** | **BA** | **DS** | **KA** | **KB** |
| *E. histolytical* | 6(8.4%) | 7(9.8%) | 9(12.6%0 | 8(11.2%) |
| Hook worm | 1(1.4%) | 3(4.2%) | 2(2.8%) | 3(4.2%) |
| *E. Coli* | 2(2.8%) | 3(4.2%) | 8(11.2%) | 4(5.6%) |
| *A.Lumbucolde* | 2(2.8%) | 4(5.6%) | 6(8.4%) | 3(4.2%) |

Source: field survey, 2022

Table 4 provides data related to the prevalence of various parasites across the four different schools, which include Brain Trust Academy (BA), Dominion Stars Academy (DS), Kwarhi A Primary School (KA), and Kwarhi B Primary School (KB). The numbers within the table represent the frequency of each parasite in each school as well as the percentage of the total cases they constitute in that school. *E. histolytical* has the highest prevalence in Kwarhi A Primary School and Kwarhi B Primary School, with 12.6% and 11.2% of each cases, respectively. It is less prevalent in Brain Trust Academy and Dominion Stars Academy.

Hookworm is more common in Dominion Stars Academy and Kwarhi B Primary School, with 4.2% prevalence in both schools. It has the lowest prevalence in Brain Trust Academy.

*E. Coli* shows a significant variation across all schools. It is most prevalent in Kwarhi A Primary School, accounting for 11.2% of cases, while it is less common in Brain Trust Academy.

*A. Lumbucolde* has a relatively consistent prevalence across all schools, with percentages ranging from 4.2% to 8.4%.

The table also shows that Kwarhi A Primary school appears to have relatively high percentage for all parasites compared to the other schools.

# CHAPTER FIVE

# DISCUSSION, CONCLUSION AND RECOMMENDATIONS

## 5.1 Discussion

The overall prevalence of intestinal parasite in the study area was 59.6% this result is lower than the one obtained or recorded by Kpukpur *et al.* (2016), who reported an overall prevalence of 63.5% in the study conducted in Urban and rural area Zaria in Kaduna state. The result is however too high when compared to the work done by Adekunle *et al.* (2015).

The study also revealed a high rate of prevalence among male with a percentage of 60% which is higher than a study conducted by Kpurkpur *et al.* (2015), who reported an overall prevalence of 45% in the study area as conducted by Adefioye *et al.* (2011).

The study also revealed a high percentage of 50.7% infection based on age for 10 – 12 years of age which is higher than that of Nxasana *et al.* (2013). The overall prevalence of parasites among all age group is 50.7%. The result is however is lower when compared to the work done by Mehraj et al. (2010).

The study revealed *E. histolytical* has the highest prevalence in the study area. These findings agree with the publication of Stephenson *et al.* (2010). The study recorded in this study was due to high prevalence of *E. histolytica,* hookworm, *G. lamblia* and *T. Trichiura*.

## 5.2 Conclusion

The study on the prevalence of intestinal parasites among pupils attending four selected primary schools in Mararaba Mubi, Hong, Adamawa State has yielded valuable insights into the extent and distribution of this public health concern. The findings are summarized as follows:

Among the four primary schools investigated (Brain Trust Academy, Dominion Stars Academy, Kwarhi A primary school, Kwarhi B primary school), Kwarhi A primary school had the highest prevalence of intestinal parasites (70%), while Dominion Stars Academy had the lowest (50%). The overall prevalence for all schools combined was 59.2%. The study identified varying prevalence rates among different age groups. The 10-12 age group exhibited the highest prevalence (50.7%), while the 4-6 age group had the lowest (11.2%). This suggests that older pupils may be more susceptible to intestinal parasites. Among male pupils, the prevalence rate was 60%, while among female pupils, it was 58.3%. The difference is minor, indicating that intestinal parasites affect both genders nearly equally. The study examined the prevalence of specific parasite species (E. histolytica, Hookworm, E. coli, A. lumbricoides) across the four schools. Each parasite species showed varying prevalence rates in different schools, highlighting the diversity of parasites in the study area.

## 5.3 Recommendations

Based on the findings of this study, several recommendations can be made to address the issue of intestinal parasites among pupils in Mararaba Mubi, Hong, Adamawa State:

1. Health Education and Awareness: Launch health education campaigns in schools to raise awareness about the risks of intestinal parasites, their modes of transmission, and preventive measures. This education should target both students and teachers.
2. Regular Screening and Treatment: Implement routine screening and deworming programs in primary schools. Schools should collaborate with local health authorities to conduct regular check-ups and administer anthelmintic treatments to infected pupils.
3. Improved Sanitation and Hygiene: Promote and enforce proper sanitation and hygiene practices within school premises. This includes access to clean water, handwashing facilities, and proper disposal of waste.
4. Age-specific Interventions: Given the higher prevalence among older pupils (10-12 age group), consider targeted interventions for this age group, such as more frequent screenings and health education programs tailored to their needs.
5. Community Involvement: Engage parents and the wider community in the efforts to combat intestinal parasites. Encourage parents to ensure that their children receive regular deworming treatments and practice good hygiene at home.
6. Government Support: Advocate for increased government support and funding for public health initiatives aimed at controlling intestinal parasites in schools. This may include the provision of medication, sanitary facilities, and trained healthcare personnel.
7. Interdisciplinary Approach: Collaborate with health professionals, educators, and local authorities to develop a comprehensive, interdisciplinary approach to combat intestinal parasites in schools.

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