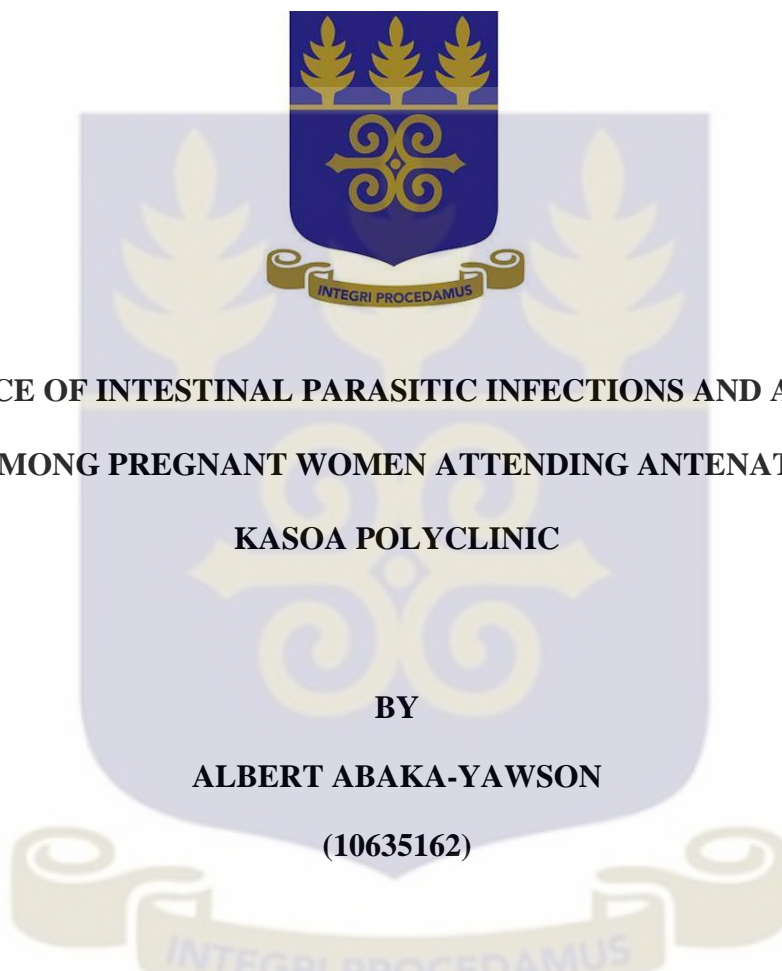


**SCHOOL OF PUBLIC HEALTH  
COLLEGE OF HEALTH SCIENCES  
UNIVERSITY OF GHANA**



**PREVALENCE OF INTESTINAL PARASITIC INFECTIONS AND ASSOCIATED  
FACTORS AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE IN  
KASOA POLYCLINIC**

**BY  
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**THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON  
IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF  
MASTER OF PUBLIC HEALTH DEGREE**

**DECEMBER, 2018**

**DECLARATION**

I, Albert Abaka-Yawson, hereby declare that except for the references to other people's work which has been duly acknowledged, this work is my original research and that this dissertation, either in whole or part has not been presented for the award of any degree in this university or elsewhere.

.....

.....

ALBERT ABAKA-YAWSON

DATE

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.....

.....

DR JOHN ARKO-MENSAH

DATE

SUPERVISOR

**DEDICATION**

I dedicate this work to my mother, Rose Abaka-Yawson who celebrates her 60<sup>th</sup> anniversary this year. May you live long to benefit from the fruits of your labour.

## **ACKNOWLEDGEMENT**

I wish to express my profound gratitude to my supervisor, Dr. John Arko-Mensah for the valuable advice and encouragement given me throughout my project work.

Special appreciation also goes to the teaching and research assistants of the Department of Medical Laboratory Science, University of Health and Allied Sciences, Ho for their assistance in pursuing this course.

I am also thankful to the staff and pregnant women at the Kasoa Polyclinic during the period of the study. I am grateful to them for their special interest and support they provided me throughout the work and beyond.

To my parents, Mr. & Mrs. Joseph Abaka-Yawson, I don't want to imagine life without you. I am very grateful for the financial support throughout my life.

Many thanks also to my friends (Maxwell Asiedu, Albert Awuku Kumi, Salomey Afari, Solomon Sosu and Gershon Zonyrah) who gave constructive criticism which helped the success of the work.

## ABSTRACT

**Background:** Intestinal Parasitic infections affect pregnant women worldwide. Such infections have life threatening implications on both mother and the developing foetus. Sub-Saharan Africa harbours the greatest proportion of intestinal parasitic infections due to socioeconomic and environmental factors. In Kasoa, in Southern Ghana, there is paucity of data on the prevalence and associated factors for intestinal parasitic infections among pregnant women.

**Objective:** The aim of the study was to determine the prevalence of intestinal parasitic infections and associated factors among pregnant women attending antenatal care in Kasoa Polyclinic.

**Methods:** A hospital based analytical cross-sectional study using simple random sampling was carried out among three hundred (300) pregnant women who attended the Kasoa Polyclinic for antenatal care. Structured questionnaires were administered to the study participants to assess socio-demographic and possible factors. Stool samples were collected from each pregnant woman and examined for the presence of intestinal parasites by microscopy using direct wet mount as well as formol ether sedimentation techniques. Data collected was entered into STATA version 15.0. Means, standard deviations, frequencies and percentages were calculated.

**Results:** Overall, prevalence of intestinal parasites was 14.3% [95% CI 11-19%]. Prevalence of the different intestinal parasites studied were; *Entamoeba histolytica* (5.0%), *Ascaris lumbricoides* (4.3%), *Giardia lamblia* (2.3%), *Trichuris trichiura* (1.3%), *Schistosoma mansoni* (0.3%), Hookworm (0.3%), *Hymenolepis nana* (0.3%) and *Isospora belli* (0.3%) were identified. There was an association between age  $\leq 30$  years [AOR= 0.17, 95% CI= 0.06-0.48], Multigravidae [AOR= 0.43, 95% CI= 0.19-0.97] and 2<sup>nd</sup> and 3<sup>rd</sup> trimesters [AOR= 4.73, 95% CI= 1.36-16.49] and intestinal parasitic infections among pregnant women.

**Conclusion:** Compared to previous studies in Ghana, the (14.3%) prevalence of intestinal parasitic infections among pregnant women is relatively low. It however suggests that intestinal parasitic infection is still a problem. Age, gravidity and parity were the major factors for the prevalence observed. Routine stool examination and provision of public health education particularly to risk groups are recommended to prevent infection of pregnant mothers and their unborn babies.

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## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 Background

Intestinal parasitic infections are primarily caused by protozoans and helminthes (Utzinger et al., 2012). They are frequently transmitted via consumption of contaminated food and water and spread from person to person through fecal-oral contact. Intestinal parasitic infections are associated with socioeconomic and environmental factors. This owes to the fact that they are prevalent in areas where there is overcrowding, limited access to clean water and poor personal hygiene (Siziya et al., 2013; Wekesa et al., 2014).

Several species of intestinal parasites can infect humans. However, the commonly occurring intestinal parasites are *Entamoeba histolytica*, *Giardia lamblia*, *Cryptosporidium*, *Ascaris lumbricoides*, *Trichuris trichiura* and hookworms i.e. *Ancylostoma duodenale* and *Necator americanus* (Abu-Madi, Behnke, & Doiphode, 2010; Cook, Swanson, Eggett, & Booth, 2009; Mahande & Mahande, 2016).

Pregnant women, especially those in Africa, are at greater risk of intestinal parasitic infections (Yakasai & Umar, 2013). A recent study in Ethiopia found 553 out of 783 (70.6%) pregnant women to be infected with intestinal parasites with helminthes being the predominant species (Feleke & Jember, 2018). In Nigeria, it was observed that 73 out of 401 (18.2%) pregnant women were living with intestinal parasite infections (Akinbo, Taiwo, Okaka, & Oriakhi, 2017).

Data from studies in Ghana showed that intestinal parasitic infections among pregnant women was 41.2% (Fuseini, Edoh, Kalifa, & Knight, 2013) and 49.6% (Tay, Agbeko, & Walana, 2017).

Variation in geographical location and hygienic practices are important factors that can contribute to prevalence of intestinal parasitic infections in any population.

Intestinal parasites such as hookworms are known to cause anemia in pregnant women (Baidoo, Tay, & Abruquah, 2010). They contribute to adverse pregnancy outcomes such as low birth weight and impaired milk production. The roundworm, *Ascaris lumbricoides* infection has also been associated with diminished food intake and weight loss in pregnant women (Wekesa et al., 2014). It has also been reported to affect survival, growth and cognitive performance of children born to infected mothers (Tay et al., 2017).

Additionally, the trophozoites of the protozoan parasite, *Entamoeba histolytica* can invade the intestinal mucosa, the liver, lungs and blood circulation of the human host leading to abdominal discomfort, pulmonary abscesses, bleeding episodes and sometimes death (Walana, Crowther, Tay, Tetteh, & Ziem, 2014).

This presents a significant public health situation that requires urgent attention. It is in view of this that the Ministry of Health, Ghana together with the Ghana Health Service set up the Neglected Tropical Diseases Control Program (NTDCP) with the sole aim of alleviating the occurrence of neglected tropical diseases including, intestinal parasitic infections in the country to an insignificant level (Walana, Aidoo, & Tay, 2014).

## 1.2 Problem Statement

An estimated 3.5 billion people are infected with at least one intestinal parasite and Africa contributes to about half the global burden (WHO, 2010). In the case of Ghana, the prevalence rate is thought to be between 2% and 78% (Duedu et al., 2015).

Kasoa is among the fastest growing satellite communities in West Africa (Ministry of Finance, 2018). Over the past 40 years, its population has increased by approximately 79 times (Nyarko, 2013). The growing population of Kasoa without commensurate provision of social amenities especially portable water and proper waste collection/disposal facilities has become a social burden for all. Additionally, about 73% of water sources available to inhabitants of Kasoa and its environs have serious issues with quality and safety (Peprah, Oduro-ofori, & Asante-wusu, 2015). Epidemiological survey has suggested these factors to be linked with intestinal parasitic infections (Wekesa et al., 2014).

Meanwhile, intestinal parasitic infections could result in anaemia in pregnant women. Additional health implications include impaired growth and congenital anomalies in newborns and can contribute to maternal and foetal deaths (Derso, Nibret, & Munshea, 2016). With anaemia among pregnant women in Ghana reported to be as high as 66.4% (Tay et al., 2017), there is the need to ascertain the prevalence of intestinal parasitic infections and factors among pregnant women resident in Kasoa. This research therefore determined the prevalence and associated factors of intestinal parasitic infections among pregnant women in Kasoa.

### **1.3 Research Questions**

1. Is the prevalence of intestinal parasitic infections among pregnant women in Kasoa lower, similar or higher than that reported in other parts of Ghana?
2. What are the possible factors associated with intestinal parasitic infections among these pregnant women in Kasoa?

### **1.4 General Objective**

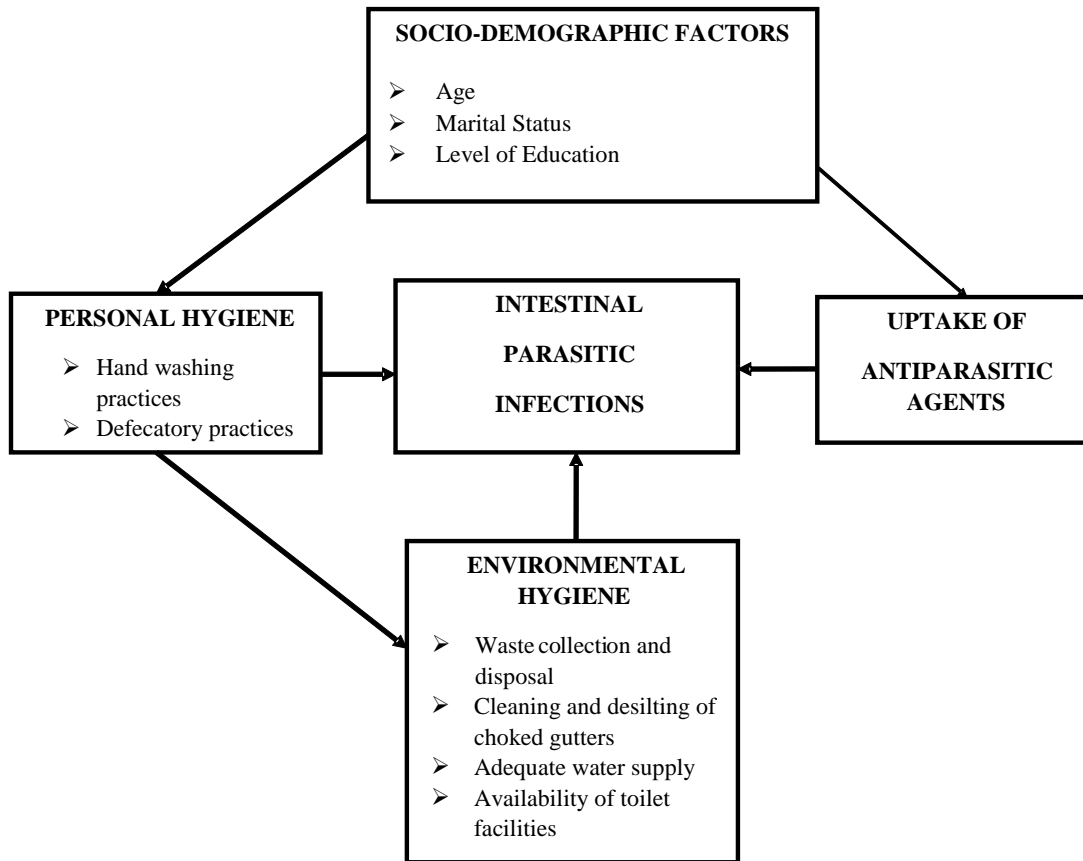
To determine the prevalence of intestinal parasitic infections and associated factors among pregnant women attending antenatal care in Kasoa

### **1.5 Specific Objectives**

1. To determine the prevalence of intestinal parasitic infections among pregnant women in Kasoa
2. To assess the factors associated with intestinal parasitic infections among pregnant women in Kasoa

## **1.6 Conceptual Framework**

Lack of basic amenities for sanitation and hygiene and ineffective implementation of social interventions such as family planning and other birth control programs have direct impact on population growth (density). Increasing population density also increases waste generation, which has the likelihood of reducing environmental sanitation and hygiene. Provision of sanitation and waste collection facilities, portable drinking water, public places of convenience, adequate drainage systems etc significantly improves the environmental health and reduces transmission of diseases including infection with worms known to be associated with poor sanitation conditions and hygienic practices. Also government interventions have direct impact on the level of education of the citizenry. The level of education of an individual also has an impact on the frequency of uptake of dewormer and other antiparasitic agents. Environmental hygiene, personal hygiene and de-worming practices affect the prevalence and distribution of intestinal parasitic infections.



**Figure 1: Conceptual Framework**

## **1.7 Justification**

Kasoa has been described as one of the fastest growing communities in West Africa (Ministry of Finance, 2018). Kasoa is also home to a large open food market, and overall, there is increased per capita waste generation without commensurable increase in waste management. This has led to high rate of fecal pollution of soil and domestic water supply around homes due to poor sanitation and improper sewage disposal. This phenomenon predisposes inhabitants to intestinal parasites particularly geohelminths (soil transmitted helminths).

In these contemporary times, World Health Organization (WHO) and various governments have utilized chemotherapy based on Mass Drug Administration to reduce such infections (WHO, 2010). To deliver this intervention successfully, there is the need to understand geographical distribution and estimates of local risks for comparison. Unfortunately, there is paucity of information on communities like Kasoa. There is therefore the need to investigate the prevalence of parasitic infections among risk groups like pregnant women as well as the predisposing factors to parasitic infection. This would give background information and overview on the prevalence rate of intestinal parasitic infection and factors among pregnant women attending antenatal care in Kasoa Polyclinic.

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

#### 2.1 Intestinal Parasites

Intestinal parasitic infections of medical importance are mainly protozoa and worms (helminths). It is a characteristic of parasites that whilst deriving maximum benefit from an intimate association with their hosts, they also inflict harm and cause disease. Intestinal parasitic infections dwell in the small or large intestine and their survival depends on feeding on nutrient from the intestinal walls. Intestinal parasitic infections have worldwide coverage (Yakasai & Umar, 2013). Majority of these infections are found in poverty stricken areas where there is low quality drinking water, poor sanitation and hygiene, as well as reduced access to health care (Wekesa et al., 2014).

#### 2.2 Intestinal Protozoan Infections

Intestinal protozoa are free-living, unicellular, eukaryotic cells. There are various intestinal protozoan species but the commonly occurring ones are the *Giardia lamblia*, *Entamoeba histolytica* and *Cryptosporidium parvum*. Intestinal protozoa *Giardia spp* causes giardiasis and *Entamoeba histolytica* is the causative agent for amoebiasis infections, and known to infect about 50 million people worldwide (Erismann et al., 2016). In general terms, they occur in various sizes from 5µm to 2mm. They possess a cytoplasmic membrane and cellular organelles, including 1 or 2 nuclei, mitochondria, food vacuoles and an endoplasmic reticulum. Protozoa have a cytostome, a special mouth for ingestion of solid food materials. They also have a protective coat called cyst and a trophozoite that converts it to a motile form when ingested (Phuanukoonnon et al., 2015).

### **2.2.1 Global Distribution of Intestinal Protozoan Infections**

Like all other intestinal parasitic infections, intestinal protozoa are known to infect people from all walks of life. However, it is particularly common in developing countries where there are sanitation problems. It is estimated that approximately 10% of the global population is currently living with *Entamoeba histolytica* (Chacon-cruz, 2009). It is also noted that most of the cases of intestinal protozoan infections are asymptomatic particularly *Entamoeba histolytica*. A higher prevalence of *Entamoeba histolytica* is also observed in institutionalized individuals in places like prisons and mental hospitals (Duedu et al., 2015). Again, children and pregnant women are at the highest risk of infection (Erismann et al., 2016).

### **2.2.2 Intestinal Protozoan Infections in Africa**

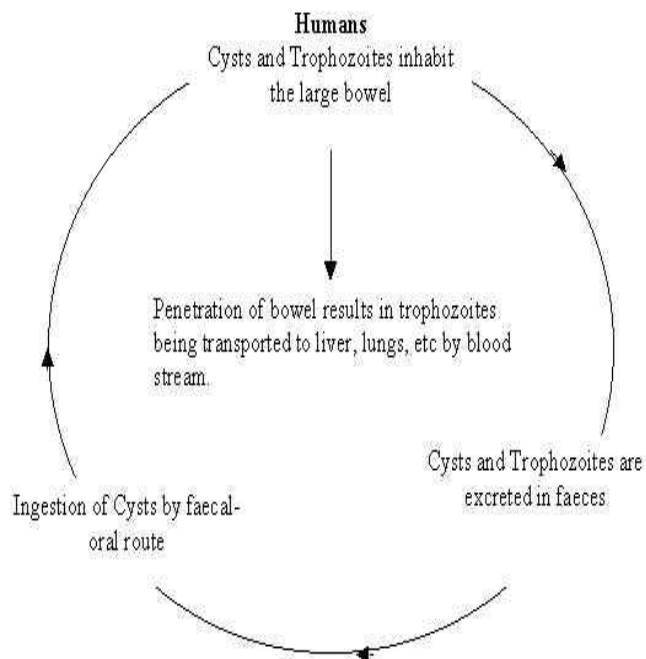
Africa harbors the highest prevalence for intestinal protozoan infections. The commonly occurring intestinal protozoa infections in Africa are caused by *Entamoeba histolytica*, *Giardia lamblia*, *Cryptosporidium parvum*. The greatest impact is felt in sub-Saharan Africa. In West Africa, intestinal protozoan infection prevalence was found to be as high as 84.7% among school children (Erismann et al., 2016). The study further reported the predominant species to be *Entamoeba histolytica*/ *Entamoeba dispar* (66.5%), *Entamoeba coli* (37.4%). Additionally, studies in East Africa reported the combined prevalence of *Giardia lamblia* and *Entamoeba histolytica* to be as high as 21.1% (Derso et al., 2016).

### **2.2.3 Intestinal Protozoan Infections in Ghana**

Prevalence of intestinal protozoan infection in Ghana is not particularly different from the rest of Africa. Various estimates have been made concerning the intestinal parasite infections. *Giardia lamblia*, *Entamoeba histolytica* and *Cryptosporidium parvum* seem to be the most prevalent. Prevalence of *Giardia lamblia* infections among children of school going age was found to be within 12.7% (Tetteh, 2012) and 16.8% (Walana, Crowther, Tay, Tetteh, & Ziem, 2014). A study among psychiatric patients in Ghana showed a prevalence of parasitic infections of 13.5% of which majority were due to *Giardia lamblia* infections (Duedu et al., 2015).

#### **2.2.4 Symptoms and Mode of Transmission**

Intestinal protozoan infections, particularly *Entamoeba histolytica*, are mostly asymptomatic. The protozoa learn to live peacefully with its host carriers. *Entamoeba histolytica* has only humans as its natural host. The infections may be passed on from person to person by the infective stage, the cyst, through fecal-oral route. *Giardia lamblia*, however, infect both humans and animals. In this case, contact with infected animals also serves as a risk factor for the contraction of giardiasis. The motile form of the amoeba is the trophozoite, which cruises along the intestinal wall eating bacteria, other protozoa species, and even human intestinal and red blood cells. The trophozoite can convert to a precyst form, with two nuclei, that matures into a tetranucleated cyst. It is the mature cyst that is eaten, infecting others. The motile trophozoites may penetrate the portal circulation, forming abscesses in the liver, followed by spread through the diaphragm into the lung. Infection by trophozoite causes pulmonary abscesses and often leading to death.



**Figure 2: Life Cycle of Intestinal Parasites**

**Source:** (Arcari, Baxendine, & Bennett, 2000)

### 2.2.5 Laboratory Diagnosis

Microscopic examination appears to be the less expensive and widely used method for the identification of intestinal protozoa especially in resource-limited settings. Several methods can be used in the microscopic examination. This includes the direct wet mount method, the formol-ether concentration method as well as the modified Ziehl-Neelsen method. Stool samples are observed for the presence of cysts and trophozoites. With *Entamoeba histolytica*, the presence of trophozoites with red blood cells in the cytoplasm is indicative of an active infection. The opposite is also true as the presence of cysts or trophozoites without internalized red blood cells suggest asymptomatic infections. In the case of *Giardia lamblia*, the infected individuals usually present with greasy, frothy, diarrhea, along with abdominal gassy distension and cramps. The cysts and trophozoites of *Giardia lamblia* commonly occur in their stools. Other diagnostic

procedures for *Entamoeba histolytica* include CT scan and ultrasound imaging on the liver to ascertain the presence of abscesses. Whilst for *Giardia lamblia*, Enzyme linked immunosorbent assay (ELISA) kits to detect the presence of antigens in watery extract of stool specimen could be used.

### **2.2.6 Treatment**

Intestinal protozoan infections treatment is species specific and the dosages are dependent on the phase of the parasite and the intensity of the infection. Metronidazole proves effective for the killing *Entamoeba histolytica* and flagellates of *Giardia lamblia*.

### **2.2.7 Prevention and Control**

Prevention of intestinal protozoan infections can widely be attained by a number of ways. Contaminated water could harbor the cyst of various intestinal protozoan. Therefore, all sources of water being pipeborne, dams, rivers, streams and boreholes should be protected from faecal contamination. Hygienic practices and geophagy (the act of eating soil or clay) should be avoided. Deworming practices should be encouraged regularly especially in parasitic endemic areas. Again, regular healthcare should be encouraged at all times. All of these could be achieved through regular health education of the citizenry on personal and environmental hygiene.

## **2.3 Intestinal Helminthic Infections**

Helminths, unlike protozoa, are multicellular organisms. They are bilaterally symmetrical in shape and have three germ layers. They are large and could be seen with the unaided eye in their mature stage. Intestinal helminths that infect humans are divided into three major categories; Nematodes, Cestodes and the Trematodes. The Nematodes include *Ascaris lumbricoides*,

*Trichuris trichiura*, *Enterobius vermicularis*, *Strongyloides stercoralis*, hookworms (*Ancylostoma duodenale* and *Necator americanus*). Cestodes include; *Taenia solium*, *Taenia saginata*, *Hymenolepis nana*, *Hymenolepis diminuta*, *Diphyllobothrium latum* among others. Trematodes include; *Schistosoma species*, *Paragonimus westermani*, *Fasciolopsis buski*, *Clonorchis sinensis* etc. The four commonly occurring geohelminths are roundworm (*Ascaris lumbricoides*), whip worm (*Trichuris trichiura*) and the hookworms (*Necator americanus* and *Ancylostoma duodenale*). Intestinal helminthes have no global boundaries but are particularly common in resource limited countries (Mcclure et al., 2014).

### **2.3.1 Distribution of Intestinal Helminthic Infections**

According to WHO, an estimated 24% of the world's population representing more than 1.5 billion are living with soil-transmitted helminth infections (WHO, 2010). These infections have no geographical boundaries as all human related intestinal parasitic infections can infect people from all walks of life. But like all other intestinal parasitic infections, the greatest impact are felt in resource limited settings limited settings like sub-Saharan Africa, the Americas, China and East Asia. The distribution of various intestinal helminthic infections is influenced by climatic factors, personal and environmental hygienic behaviours (Siziya et al., 2013; Wekesa et al., 2014).

### **2.3.2 Prevalence of Intestinal Helminthic Infections in Africa**

Africa is known to harbor the greatest proportion of intestinal helminthic infections. Today, it is estimated that over 50% of population of sub-Saharan have been documented to be infected with one species of intestinal helminth or the other (Sousa-Figueiredo, Gamboa, Pedro, Fancony, & Langa, 2012). The commonly occurring intestinal helminthes are the hookworms, *Ascaris*

*lumbricoides* and *Trichuris trichiura*. In Nigeria, geohelminthic infections was found to be 30.3% (Odinaka, Nwolisa, Mbanefo, Iheakaram, & Okolo, 2015). Hookworm (*Necator americanus* and *Ancylostoma duodenale*) infections have been reported have been reported to be the predominant helminthic infection especially among risk groups such as pregnant women and children (McClure et al., 2014; Odinaka et al., 2015). Recent findings in South West Cameroon also suggests that *Ascaris lumbricoides* and *Trichuris trichiura* rather presents the most harm (Nkengazong et al., 2010). Another research in Burkina Faso among schoolchildren reported rather contrasting finding with *Hymenolepis nana* being the predominant species (Erismann et al., 2016).

### **2.3.3 Intestinal Helminthic Infections in Ghana**

Ghana contributes significantly to intestinal helminthic infections burden in Africa. The poor sanitation and lack of personal hygiene practices account for this phenomenon. Prevalence studies have been carried extensively on risk groups such as expectant mothers, children, food vendors and psychiatric patients with significantly elevated findings. The commonly occurring species of helminthes are the *Schistosoma mansoni*, *Ascaris lumbricoides*, Hookworm (*Ancylostoma duodenale* and *Necator americanus*). According to Fuseini et al., (2013), an estimated 20.7% of pregnant women in the Kassena-Nankana District of Northern Ghana are infected with intestinal helminthes. The most prevalent helminthes according to their research include; *Schistosoma mansoni* (12.22%), *Ascaris lumbricoides* (0.7%), Hookworms (7.0%), *Strongyloide sstercoralis* (2.3%). Another related study by Yatich et al., (2009) also reported similar prevalence (25.7%). The latter study also reported *Ascaris lumbricoides* and hookworm as the most prevalent.

### **2.3.4 Symptoms and Mode of Transmission**

Intestinal helminthes life cycle and mode of transmission vary from species to species. *Ascaris lumbricoides* are passed through the environment to form the infective eggs. They are ingested via contaminated food and hatch in their individual human host carriers. There is the release of larvae that migrates via the lungs and respiratory tract and reach again the intestinal tract where they mature. *Trichuris trichiura* follows a related lifecycle. It also requires a period of maturation in the environment before they develop into the infective stage. The ingested eggs, however, directly develop into the adult worm in the intestine without migration. For the case of the hookworms, their eggs leave the human body through stool to the soil where the larvae are released to develop to an infective larval stage. The filariform larvae actively penetrates the human skin and migrates via blood vessels, heart, lungs and the small intestines, where they mature to form the adult worm.

Intestinal helminthes are usually accompanied by some extreme devastating symptoms and medical complications. These worms can cause abdominal pains, weight loss, diarrhoeal episodes and anaemia. These symptoms could have untold repercussions on risk groups such as pregnant women and children (Tay et al., 2017).

### **2.3.6 Laboratory Diagnosis**

Microscopic examination serves as the primary diagnostic tool. With regards to the microscopic examination, several methods exist. Regis et al., (2012) describes some of these methods as spontaneous sedimentation method of Hofmman and Lutz; centrifugal floatation method of Faust; kato-katz method and centrifugation method of Ritchie. Diagnosis is made by the detection of the helminthic species of interest in the stool sample. The shapes of the intestinal

helminthes vary from species to species. The eggs of *Ascaris lumbricoides* are oval in shape. *Ancylostoma duodenale* and *Necator americanus* have eggs that cannot be easily differentiated from each other except by culture. *Trichuris trichiura* eggs can also be detected in stool samples. The eggs appear barrel shaped, unembryonated with bipolar plugs.

### **2.3.7 Treatment**

With regards to the treatment of intestinal helminthes, metronidazoles and bezimidazoles are usually administered. Metronidazole is very effective for the treatment of *Trichuristrichiura* whilst the benzimidazoles specifically the Albendazole and Mebendazole can effectively treat the hookworms (*Ancylostoma duodenale* and *Necator americanus*) and *Ascaris lumbricoides* related infections. Other three drug combinations that are reported to show strong synergistic properties are Mebendazole - Ivermectin , Mebendazole- Levamisole, Albendazole – Mebendazole (Keiser, Tritten, Adelfio, & Vargas, 2012). Research by Tay et al., (2017)suggests that there is an association between intestinal parasitic infections and anaemia. Therefore in treating intestinal helminthes infections, there is the need to investigate and subsequently treatment for anaemia if it exists. Iron supplement should then be supply to patients to treat anaemia.

### **2.3.8 Prevention and Control**

Like all other intestinal parasitic infections, prevention of intestinal helminthic infections can be achieved through the protection of all sources of drinking water from faecal contamination, improved personal and environmental sanitation and regular deworming practices. Frequent health education and promotion is also vital in preventing and controlling such infections.

## **2.4 Prevalence of Intestinal Parasitic Infection among Pregnant Women**

A study conducted in Asia, found the prevalence of intestinal parasite infection to be 37% among pregnant women by microscopy. Out of this number, 28 (32.2%) were infected with at least one parasite and 4 (4.6 %) with more than 2 parasites (Sehgal et al., 2010). In Colombia, in South America, the prevalence rate was found to be as high as 41% (Espinosa Aranzales et al., 2018). Additionally, a low prevalence was observed in Northern Tanzania. In this study, the prevalence for amebiasis and helminthiasis was 0.7 % , and 0.6 % respectively (Mahande & Mahande, 2016). Again on helminths a study in Gilgel Gibedam Area, Southwest Ethiopia reported a prevalence of, Hookworm 114 (29.4%), *A. lumbricoides* 58 (14.9%), *T. trichiura* 13 (3.4%), *H. nana* 8 (2.1%), *E. vermicularis* 5(1.3%) (Getachew, Tafess, Zeynudin, & Yewhalaw, 2013).

Further, a study conducted in West Africa, revealed relatively high prevalence of parasitic infections among the study population, suggesting that about three-quarters of the women are either single or co-infected with parasitic agents (Tay et al., 2017). Whilst another research among schoolchildren in the West African sub-region also recorded 84.7% prevalence for intestinal protozoa and 10.7% for helminth infections (Erismann et al., 2016).

## **2.5 Factors associated with intestinal parasitic infection and pregnant women**

### **2.5.1 Age**

With regards to age, the odds for intestinal parasitic infection were approximately two folds higher (COR = 1.74,  $p = 0.64$ ) in pregnant women whose age was between 30 and 34 years compared to those whose age was between 40 and 44 years (Dereso et al., 2016). Similar findings

were also found among pregnant women in Ghana where young age was found to be associated with parasitic infections (Yatich et al., 2009). On the contrary, other studies have also suggested that age is not significantly associated with intestinal parasitic infections (Akinbo et al., 2017; Dankwa et al., 2017; Espinosa Aranzales et al., 2018; Forson et al., 2017).

### **2.5.2 Parity and Gravidity**

A study conducted in Northwest Ethiopia found primigravidae women to have 25% increased odds of intestinal parasitic infection compared to multigravidae women (Derso et al., 2016). Other findings in Ghana and Papua New Guinea support this claim where primigravidae was linked with intestinal parasitic infections (Phuanukoonnon et al., 2015; Yatich et al., 2009)

In addition, a study by Espinosa Aranzales et al., (2018) found no association between stage of pregnancy and increased prevalence of intestinal parasite infection. Although Derso and colleagues did not find a direct association, they found that there was a higher odd of increased infection during the second trimester compared to the third (Derso et al., 2016).

### **2.5.3 Availability and Type of Toilet Facilities Used**

The availability and type of toilet facility been used by individuals have been proven to be a risk factor for the contraction of various intestinal parasitic infections. A study in this regard conducted at the Kitale District Hospital, Kenya showed that, women who did not use pit latrines were 95.2% more likely to be infected compared to 4.8% who were using toilet as source of waste disposal (Wekesa et al., 2014). Whilst other contrasting findings have reported no association between type of toilet and intestinal parasitic infections (Forson et al., 2017).

#### **2.5.4 Hand Washing Practices**

Hand washing practices especially after visiting toilet facilities and before eating has been documented to reduce the likelihood of intestinal parasitic infections. Hand washing with soap at critical times has been associated with 68% reduction in intestinal parasitic infections (Mahmud et al., 2015). Similar findings were also reported in related studies (Dankwa et al., 2017). Though there was no statistical significance, Derso et al., (2016) observed that as hand washing practice before meal was decreased by one, the odds of intestinal parasitic infection were increased by 19%. Additionally, the statistical analysis showed that the odds of infection were about four times higher (COR = 3.74,  $p = 0.07$ ) in pregnant women who had no habit of hand washing after toilet than those who had the habit of washing their hands after toilet (Derso et al., 2016).

#### **2.5.5 Deworming Practices**

Research among food vendors in Accra recorded a significant proportion (55.6%) of those who had a deworming history to be infected with parasitic infections while 68% of those with no deworming history were found to be infected (Ayeh-kumi et al., 2009). Another study has reported similar findings where more than half (55.4%) of food vendors who admitted to not deworming for six (6) months or more being infected with various intestinal parasitic infections (Adams & Lawson, 2014). Yatich et al., (2009) also reported that the uptake of dewormer reduces the risk of intestinal parasitic infections but not significantly. This suggests that the uptake of dewormer alone may not necessarily be a protective factor against intestinal parasitic infections.

## 2.6 Intestinal Parasitic Infections and Anaemia

The mechanism by which intestinal parasitic infections cause anaemia is not fully understood. There is however found significant association between intestinal parasitosis and anemia during pregnancy. A recent study has reported that intestinal parasitosis accounted for an estimated one-quarter of anaemia conditions in expectant Kenya mothers (McClure et al., 2014) whilst in Ghana it could be as much as three-quarters (Tay et al., 2017). Again, Baidoo et al., 2010 observed an association between hookworm infection and low iron stores. They further suggested that hookworm (*Necator americanus*) is a strong predictor of iron status. Low iron status is known to contribute to low haemoglobin concentration, thereby causing anaemia (Ofojekwu et al., 2018).

## **CHAPTER THREE**

### **3.0 METHODS**

#### **3.1 Type of Study**

The study was a hospital based analytical cross – sectional study. It was conducted among pregnant women attending antenatal care at Kasoa Polyclinic. These pregnant women were interviewed using a structured questionnaire to collect data on their socio-demographic characteristics and risk factors for intestinal parasitic infections.

#### **3.2 Study Location / Area**

The study was conducted at the antenatal care clinic and laboratory department of the Kasoa Polyclinic. The Polyclinic is located in Kasoa Central. Kasoa is the capital of the Awutu Senya East municipality in the Central Region of Ghana. The town is situated along the Accra-Cape Coast road. The coordinates of Kasoa are: 05 31 12N, 00 28 48W (Latitude: 5.5345; Longitude: - 0.4167). It lies approximately 28 kilometres (17 minutes), by road, west of the central business district of Accra. It has a total of about 69,384 people, which represents more than 79 times its population 40years ago (Nyarko, 2013). Kasoa has the main regional market (Porter et al., 2008). It is also common knowledge that the town faces huge vehicular traffic jams as well as indiscriminate, unplanned, haphazard building of structures.



**Figure 3: Map of Kasoa with arrow showing Kasoa Health Centre, now Kasoa Polyclinic**

**Source: Google Map, 2018**

### **3.3 Variables**

#### **3.3.1 Outcome/ Dependent Variable**

The outcome/ dependent variable for the study is the prevalence of parasitic infections. This was obtained by examining individual stool samples for presence of intestinal parasites.

#### **3.3.2 Exposure/Independent Variable**

- ✓ Environmental Hygiene
- ✓ Personal Hygiene
- ✓ Uptake of Dewormer

- ✓ Level of Education

### 3.4 Study Population

The study participants were pregnant women. They were recruited at the Kasoa Polyclinic during attendance for antenatal care services. Women in all stages of their pregnancy were recruited. Study participants who did not seem to understand the study upon several explanations were excluded from the study.

### 3.5 Sampling

#### 3.5.1 Sample Size

The prevalence of parasitic infections among pregnant women was determined from a Ghanaian study by Fuseini et al., 2010 to be 23.0%. The prevalence rate from that study was used to calculate the sample size to be 272. Additional 28 samples were added as a buffer against non-response. A final sample size of 300 study participants was chosen as illustrated below;

The sample size for the study was calculated using Fisher's sampling formula below;

$$N = \frac{Z^2 P(1 - P)}{D^2}$$

Where;

N represents the estimated sample size

Z represents the constant for 95% confidence interval given as 1.96

P represents the average prevalence of intestinal parasitic infections of 23.0% obtained from a study conducted among pregnant women in Kassena-Nankana district of the Northern Region

D represents the percentage margin of error taken as 5%

$$N = \frac{1.96^2 * 0.23 * 0.77}{0.05^2}$$

N = 272

Additional 10% of the sample,  $N = (\frac{10}{100} \times 272) + 272$

$$N = 299.2 = 300$$

### **3.5.2 Sampling Technique**

Simple random sampling technique was employed to collect data from pregnant women attending antenatal care at the health facility. Random numbers were generated and used to recruit participants until the sample size was obtained.

## **3.6 Data Collection Techniques**

### **3.6.1 Questionnaire Administration**

Study participants were given structured closed ended questionnaires to obtain data pertaining to socio-demographic, behavioral and environmental factors in the community. The questionnaires were administered to pregnant women who had given their consent to take part in the study.

### **3.6.2 Sample Collection**

Clean screw capped plastic stool containers with wide neck were given to the study participants. The stool containers were identified by pre-labeling them by marking with unique identification numbers. The study participants were requested to provide about 2g of stool sample. Early

morning stool samples submitted by participants were analyzed for parasites by direct wet mount method and formol-ether concentration technique. Each stool sample collected was analyzed within 30 – 60 minutes. Also, samples that could not be analyzed within a particular day were refrigerated at 4<sup>0</sup>C. Early morning stool samples submitted by the study participants underwent laboratory analysis for the presence of parasites (trophozoites, cysts, ova and larvae etc.). Two slides were then prepared per sample by direct wet mount and two slides after formol-ether concentration method. The slides were examined and considered positive when there was a parasite in at least one of them.

### **3.6.3 Laboratory Analysis**

#### **Direct Wet Mount Method**

The collected stool samples were mixed in 3-4ml normal saline. A drop of the sample was then placed on a glass slide and covered with a coverslip. The preparation was first examined under a 10x objective lens, then 40x for identification of parasites under low light intensity as described by with slight modification.

#### **Formol-Ether Concentration Technique**

One gram (1g) of each stool sample was mixed with 3-4 ml of 10% formol saline. An additional 3-4ml of 10% formol saline was added; this was then mixed thoroughly and passed through gauze. Three-Four (3-4) ml of diethyl ether were added and mixed adequately. The mixture was then sedimented by centrifugation at 3000rpm for five (5) minutes. The supernatant was then discarded and the sediments re-suspended in formol saline. The sediments were examined

microscopically under 10x and 40x magnification for the presence of parasitic organisms as described by with slight modification.

### **3.7 Quality Control**

Known positive and negative slides for the various intestinal parasites were tested using the direct wet mount method and formol ether concentration method as indicated in the laboratory procedure. Samples and slides were declared positive when various stages of the parasites, such as trophozoites, cysts, ova and larvae, were observed. This was to ensure reliability of the test procedure as well as a refresher course for the researcher.

### **3.8 Data Processing and Analysis**

Data collected from the questionnaires and results from the laboratory was checked for correctness and entered into Microsoft Excel software. The compiled data was analyzed using Stata SE version 15 (64bit). Descriptive method of analysis such as tables and graphs were used to analyze and illustrate the occurrence of the various factors in the study. The magnitude of association between intestinal parasitic infections and potential risk factors was then assessed using logistic regression and described in terms of odds ratio (OR) at 95% confidence interval.

### **3.9 Ethical Issues / Consideration**

#### **3.9.1 Potential Risk / Benefit**

This study did not pose any major risks to its respondents as clean and sterile materials were used for testing for the presence of intestinal parasitic infections among the pregnant women. The potential risk that could have arisen during the stool sample collection stage was where the

study participants could have infected themselves with parasitic agents from the toilet if hands were not washed. In view of that, the researcher provided toiletries (toilet roll, soap and hand sanitizer) to participants that used the toilet facility. The study participants spent about 30 minutes in answering questionnaires and stool sample collection for onward testing of the various intestinal parasitic infections. Study participants who wanted to know the outcome of their test had to wait not more than an hour.

As stated earlier, there were direct benefits of the study to the participants. It provided them an opportunity to test for intestinal parasitic infections. Again, it afforded them the chance to seek early treatment should there be any parasitic infection among them.

### **3.9.2 Privacy and Confidentiality**

Privacy and confidentiality of the respondents were ensured at all stages of the study. Questionnaires designed for the study did not make use of names but rather serial numbers. Again, the questionnaires were administered to the study participants individually in an enclosed room. Finally, the outcome of the laboratory testing were kept strictly confidential.

### **3.9.3 Data Storage and Usage**

Materials for the study that contained information on study participants were kept strictly under lock and key by Principal Investigator. The data obtained from the study were cleaned and entered into Stata SE version 15 (64bit) software with the identification numbers and electronic files were made available only to the research team.

### **3.9.4 Institutional Approval**

Ethical approval was sought from the ethical review committee of Ghana Health Service before the commencement of the study. Permission was also obtained from the management of Kasoa Polyclinic.

### **3.9.5 Voluntary Consent / Withdrawal**

Informed written and verbal consent was sought from the study participants before inclusion in the study. The study objectives and procedure, as well as possible risks and benefits associated with participating in the study were explained to the study participants in English and the local language. Research was carried out only on those who agreed to participate and satisfied the inclusion criteria. All responses were kept confidential.

### **3.9.5 Compensation**

Study participants recruited did not benefit from any monetary compensation. There was however health education on intestinal parasitic infections and its documented risk factors to the pregnant women prior to the study. The hospital administration would also receive a copy of the final research findings. Additionally, the findings of the research would be discussed with the management of the hospital and the municipal assembly. Appropriate recommendation would also be made for onward implementation.

### **3.9.6 Declaration of Conflict of Interest**

There were no conflicts of interest in the study.

### **3.9.7 Research Funding**

The study was sponsored by the Principal Investigator.

### **3.10 Pretest or Pilot Study**

The questionnaires were pretested at Winneba Government Hospital. Accuracy and correctness of spelling and willingness of respondents to answer certain questions were checked during this period. Again, it was evaluated for clarity of the questions asked. After pre-testing, the questionnaires were reviewed based on the information gathered prior to the commencement of the main survey.

## CHAPTER FOUR

### 4.0 RESULTS

#### 4.1 General Characteristics of Study Participants

The study recruited three hundred (300) pregnant women. The ages of the women ranged from 16 to 50 years with an average age of  $28.2 \pm 0.34$ . A hundred and eighty-six (62.0%) participants were within 21 to 30 years. Twelve (4.0%) participants were less than 20 years. Ninety-six (32.0%) participants were within 31 to 40 years whilst six (2.0%) participants were within 41 to 50 years representing the least age group.

With regards to educational background, 57 (19.0%) of the women had no formal education, 75 (25.0%) had some level of primary education, 116 (38.7%) had up to the Junior High School education, 38 (12.7%) had Senior High School education and 14 (4.7%) had tertiary level.

Furthermore, 70 (23.3%) of the women were single whilst 230 (76.7%) of them were married. Also, with respect to their employment status, 95 participants representing 31.7% were unemployed whilst 205 (68.3%) were gainfully employed.

Additionally, about 57.3% and 73.7% of the pregnant women were primigravidae and in their late trimesters of pregnancy respectively. With regards to type of toilet facility used, 234 (78%) participants had their own facility. Majority of them also practiced hand washing before meals and after visiting the toilet facility.

Also, 85.7% of the participants prepared food at home and 96.3% of the participants drank water from treated sources. Deworming practices among the pregnant women also saw 212 (70.7%) deworming in more than 6 months representing the majority as shown in Table 4.1.

**Table 4.1: General characteristics of study participants**

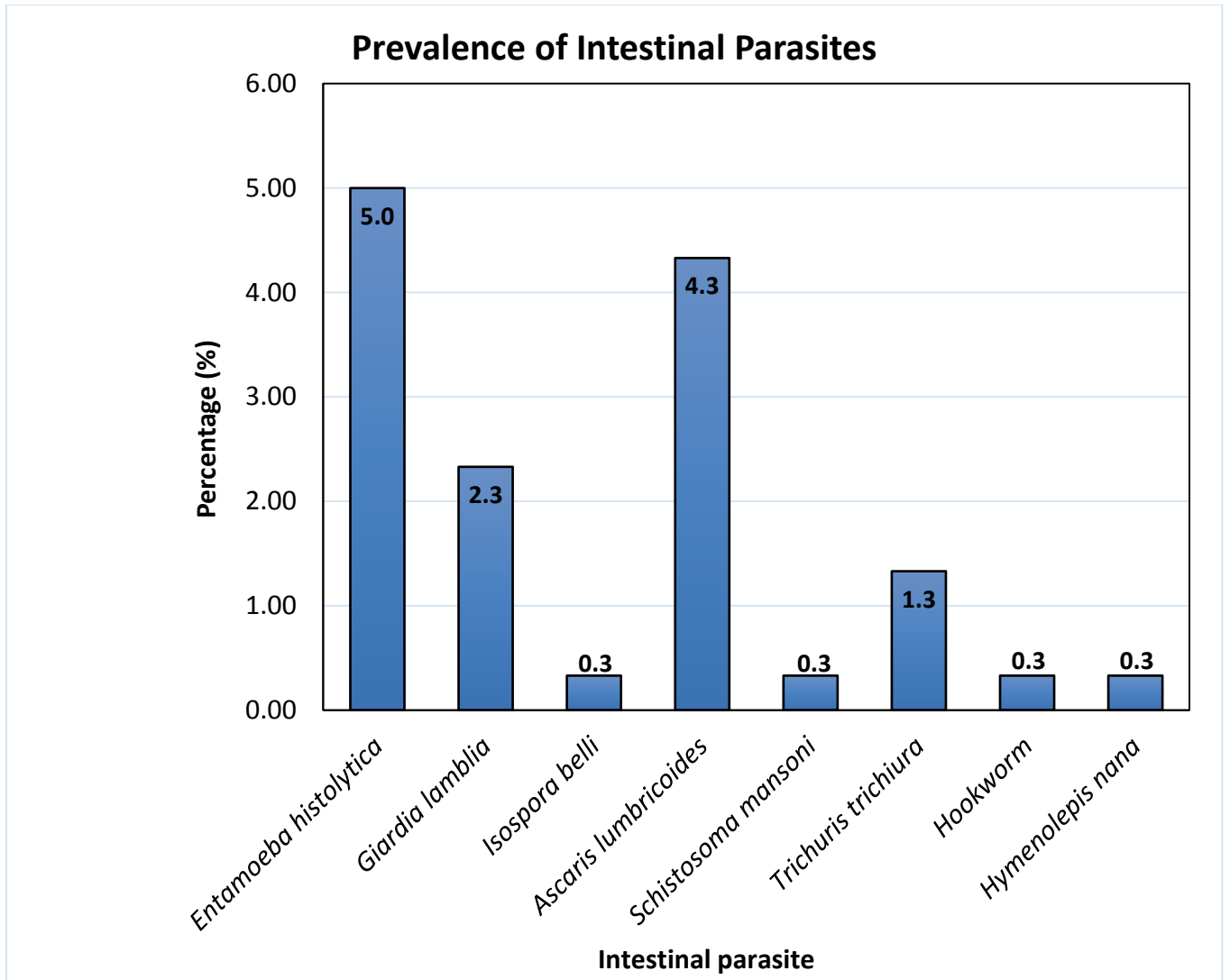
<b>Variable</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Age in years</b>		
≤ 20	12	4.0
21-30	186	62.0
31-40	96	32.0
41-50	6	2.0
<b>Educational Level</b>		
None	57	19.0
Primary	75	25.0
J.S.S	116	38.7
S.S.S	38	12.7
Tertiary	14	4.7
<b>Marital Status</b>		
Single	70	23.3
Married	230	76.7
<b>Employment Status</b>		
Unemployed	95	31.7
Employed	205	68.3
<b>Gravidity</b>		
Primigravidae	172	57.3
Multigravidae	128	42.7
<b>Stage of Pregnancy</b>		
First Trimester	79	26.3
Late Trimesters	221	73.7
<b>Type of Toilet facility</b>		
Owned	234	78.0
Shared	66	22.0
<b>Handwashing before meals</b>		
No	11	3.7
Yes	289	96.3
<b>Feeding</b>		
Prepare food at home	257	85.7
Buy food outside	43	14.3
<b>Drinking water Sources</b>		
Treated Sources	289	96.3
Untreated Sources	11	3.7
<b>Deworming History</b>		
≤ 6months	88	29.3
>6months	212	70.7

#### 4.2 Prevalence of Intestinal Parasitic Infections

Out of the 300 pregnant women whose stool samples were examined by direct wet mount and formol-ether concentration techniques, 43(14.3%) of them had intestinal parasites. Out of this, 23(7.7%) participants had intestinal protozoan parasites and the remainder 20(6.7%) were infected by intestinal helminthes.

The predominant protozoan parasite was *Entamoeba histolytica* which accounted for 15(5.0%) infections among pregnant women. This was followed by *Giardia lamblia* 7(2.3%) and *Isospora belli*, 1(0.3%).

With regards to helminthic infections, the predominant parasite species was *Ascaris lumbricoides* which had a prevalence of 13(4.3%). Following closely was *Trichuris trichiura*, 4(1.3%). Other parasites seen were *Schistosoma mansoni* 1(0.3%), *Hymenolepis nana* 1(0.3%) and Hookworm 1(0.3%) in Figure 3.



**Figure 3: Prevalence of Intestinal Parasitic Infections among Pregnant Women**

### 4.3 Factors Associated with Intestinal Parasitic Infections

Table 4.2 shows the logistic regression analysis of socio-demographic characteristics with intestinal parasitic infections. Three factors were identified to be associated with intestinal parasitic infections by the univariate logistic regression analysis. These include age [Crude OR=0.22; 95% CI= 0.83-1.57; p=0.002], education [Crude OR=0.41; 95% CI= 0.21-0.80; p=0.0029] and employment status [Crude OR=0.38; 95% CI= 0.20-0.73; p=0.004].

After adjusting for potential confounders using multivariate logistic regression analysis, only age showed a statistically significant association with intestinal parasitic infections. Pregnant women above 30years had 83% reduced odds of having intestinal parasitic infections compared to those who were 30years and below [AOR = 0.17; 95% CI = 0.06, 0.48; p< 0.001].

**Table 4.2: Univariate and multivariate analysis of intestinal parasitic infections across socio-demographic characteristics of pregnant women in Kasoa Polyclinic**

<b>Characteristics</b>	<b>Number Examined (%)</b>	<b>Number Of Positive Cases (%)</b>	<b>COR (95% CI)</b>	<b>P-value</b>	<b>AOR (95% CI)</b>	<b>P-value</b>
<b>Age</b>						
≤ 30yrs	198 (66.0)	38 (19.2)	1	<b>0.002</b>	1	<b>0.001</b>
> 30yrs	102 (34.0)	5 (4.9)	0.22(0.83-1.57)		0.17(0.06-0.48)	
<b>Education</b>						
Less J.H.S	132(44.0)	27 (20.5)	1	<b>0.009</b>	1	0.125
J.H.S and above	168 (56.0)	16 (9.5)	0.41(0.21-0.80)		0.55(0.26-1.18)	
<b>Marital Status</b>						
Single	70 (23.3)	9 (12.9)	1	0.688		
Married	230 (76.7)	34 (14.8)	1.18(0.53-2.59)			
<b>Employment</b>						
Unemployed	95 (31.7)	22 (23.2)	1	<b>0.004</b>	1	0.066
Employed	205 (68.3)	21 (10.2)	0.38(0.20-0.73)		0.49(0.23-1.05)	

In the univariate analysis, factors such as type of toilet facility used, hand washing before meals and drinking water sources were associated with intestinal parasitic infections among pregnant women. Pregnant women who shared a toilet facility had 2.78 folds greater odds of intestinal parasite infections compared to those who owned a toilet facility [COR= 2.78; 95% CI= 1.40-5.51; p=0.004].

Again, in this same model, pregnant women who washed their hands before meals had 82% reduced odds of intestinal parasite infections compared to their counterparts who didn't [COR= 0.18; 95% CI= 0.05-0.63; p=0.007]. Also, drinking water from untreated sources was associated with 5.5 times greater odds of intestinal parasitic infections [COR= 5.50; 95% CI= 1.60-18.92; p=0.007].

After adjusting for potential confounding among the study variables the following results were obtained. Gravidity was significantly associated with intestinal parasitic infections among pregnant women. There was 57% reduced odds of intestinal parasitic infections among multigravida women compared to their primigravida counterparts [AOR= 0.43; 95% CI= 0.19, 0.97; p=0.043].

Additionally, the stage of pregnancy was also significantly linked with intestinal parasitic infections. The odds of intestinal parasitic infections among pregnant women in their late trimesters was 4.73 times higher compared to pregnant women in their first trimester [AOR= 4.73; 95% CI = 1.36,16.49; p=0.015] as shown in Table 4.3.

**Table 4.3: Univariate and Multivariate Logistic Regression analysis of Intestinal Parasitic Infections with regards to gravidity, deworming status and hygienic practices**

<b>Characteristics</b>	<b>Number Examined (%)</b>	<b>Number of Positive Cases (%)</b>	<b>COR (95% CI)</b>	<b>P-value</b>	<b>AOR (95% CI)</b>	<b>P-value</b>
<b>Gravidity</b>						
Primigravidae	172 (57.3)	31 (18.0)	1	<b>0.037</b>	1	<b>0.043</b>
Multigravidae	128 (42.7)	12 (9.4)	0.47(0.23-0.96)		0.43(0.19-0.97)	
<b>Stage of Pregnancy</b>						
First Trimester	79 (26.3)	3 (3.8)	1	<b>0.005</b>	1	<b>0.015</b>
Late Trimesters	221 (73.7)	40 (18.1)	5.60(1.68-18.65)		4.73(1.36-16.49)	
<b>Type of Toilet Facility</b>						
Owned	234 (78.0)	26 (11.1)	1	<b>0.004</b>	1	0.186
Shared	66 (22.0)	17 (25.8)	2.78(1.40-5.51)		1.72(0.77-3.86)	
<b>Hand washing Before Meals</b>						
No	11 (3.7)	5 (45.5)	1	<b>0.007</b>	1	0.055
Yes	289 (96.3)	38 (13.2)	0.18(0.05-0.63)		0.25(0.06-1.03)	
<b>Feeding</b>						
Prepare food at home	257 (85.7)	34 (13.2)	1	0.187		
Buy food outside	43 (14.3)	9 (20.9)	1.74(0.77-3.94)			
<b>Source of Drinking water</b>						
Treated sources	289 (96.3)	38 (13.2)	1	<b>0.007</b>	1	0.079
Untreated sources	11 (3.7)	5 (45.5)	5.50(1.60-18.92)		3.42(0.87-13.48)	
<b>Deworming History</b>						
≤ 6 months	88 (29.3)	8 (9.1)	1	0.100		
> 6 months	212 (70.7)	35 (16.5)	1.977(0.88-4.46)			

## CHAPTER FIVE

### 5.0 DISCUSSION

The overall prevalence of intestinal parasitic infections among pregnant women from the study was found to be 14.3% [95% CI 11.0-19.0%]. This finding is similar to a prevalence of 14.32% obtained from a previous study in Northwest Ethiopia (Alem et al., 2013), 13.8% in Kenya (Wekesa et al., 2014) and 13.0% in Ghana (Ayeh-Kumi et al., 2009; Baidoo et al., 2010). In contrast, relatively higher prevalence rates have been reported in other studies. For example, a prevalence of 49.6% has been reported in Ghana (Tay et al., 2017), 70.6% in Ethiopia (Feleke & Jember, 2018). Furthermore, significantly lower infection rate of 3.73% was reported in Iran (Balarak et al., 2016).

*Entamoeba histolytica* contributed to the majority of intestinal parasites identified in the study representing 34.97%. Although this finding differs from those of Obiakor-Okeke et al., (2014) and Forson et al., (2017), they are consistent with those of others including Omorodion et al., (2012) and Akinbo et al., (2017) where *E. histolytica* was the most prevalent. *Entamoeba histolytica* was followed by *Ascaris lumbricoides* (30.26%). The high prevalence of these two parasites poses a serious health threat to the pregnant women infected. These parasites are known to contribute to bleeding episodes and may lead to adverse pregnancy outcomes that can be life threatening if not addressed.

With regards to *Giardia lamblia*, it accounted for 16.28% of the infections among the pregnant women. This finding is much higher than that obtained by similar studies in Nigeria (Akinbo et al., 2017; Obiakor-Okeke et al., 2014).

Hookworm contributed to 2.31% of intestinal parasitic infections identified in the study. This results contrasts with that of similar studies which reported higher prevalence (Akinbo et al., 2017; Fuseini et al., 2013; Umeh et al., 2018). The low prevalence rate of hookworm infections observed in this study could be due to good sanitation and proper sewage disposal, as seen in the fact that many participants (78%) had their own toilet facilities rather than shared. The other reasons are that majority eat food prepared at home (85.7%), drink potable water (96.3%) and wash hands with soap before meals (96.3%).

For *Trichuris trichiura*, it accounted for 9.29% of the infections. This was comparable to results obtained among pregnant women in Kenya (Wekesa et al., 2014) but higher than findings observed in Papua New Guinea (Phuanukoonnon et al., 2015). Other parasites observed were; *Schistosoma mansoni*, *Hymenolepis nana* and *Isospora belli* with each of them contributing to 2.31% of intestinal parasites infections.

Intestinal parasitic infection among pregnant women was determined by age, gravidity and parity. Older age was associated with a reduction in intestinal parasitic infections. This may be due to older women having better knowledge on personal and environmental hygienic practices compared to pregnant women of lower age. Other studies did not find any association between age and intestinal parasite infections among pregnant women (Derso et al., 2016; Espinosa Aranzales et al., 2018; Fuseini et al., 2013).

The stage of pregnancy/ gestational age was also found to be associated with intestinal parasitic infections. The second and third trimesters were associated with increased odds of intestinal parasitic infections among women. This observation is consistent with previous findings where the second and third trimesters of pregnancy presented higher odds of intestinal parasite

infections than their counterparts in their first trimester (Akinbo et al., 2017; Umeh et al., 2018). Espinosa Aranzales and her colleagues reported a rather contradictory finding where stage of pregnancy had no association with intestinal parasitic infections (Espinosa Aranzales et al., 2018).

Additionally, the study found gravidity to be associated with the odds of intestinal parasitic infections. Multigravida women had reduced odds of intestinal parasitism compared to primigravida women. The findings are in line with that of Phuanukoonnon et al., (2015) and Yatich et al., (2009). This observation may be attributed to the fact that multigravida women have previous pregnancy experience and therefore may have benefitted from public health education on various practices to avoid intestinal parasitic infections.

Finally, none of the sanitation and hygienic practices was associated with intestinal parasitic infections among pregnant women. Whilst the result is in line with those of Derso et al., (2016) and Espinosa Aranzales et al., (2018), they disagree with other findings obtained in Ethiopia where hand washing practices, availability of toilet facilities and feeding habits were found to be associated with intestinal parasite infections in pregnancy (Feleke & Jember, 2018). This makes the role of hygienic practices in intestinal parasite infections unclear.

## CHAPTER SIX

### 6.0 CONCLUSIONS AND RECOMMENDATIONS

#### 6.1 Conclusion

Intestinal parasitic infection was observed among pregnant women in this study. The predominant intestinal protozoan infection was *Entamoeba histolytica*, followed by *Giardia lamblia* and then *Isospora belli*. The predominant intestinal helminth infection among the women was found to be *Ascaris lumbricoides* followed by *Trichuris trichiura*, *Schistosoma mansoni*, Hookworm, *Hymenolepis nana*.

Additionally, the study revealed that women in the second and third trimesters of pregnancy had higher odds of intestinal parasitic infections compared to their counterparts in their first trimester. Multigravida women had reduced odds of intestinal parasitic infections compared to primigravida women.

Finally, sanitation and hygienic practices were found to have no association with intestinal parasitic infections, even though they are key strategies for minimizing the transmission of such infections.

#### 6.2 Recommendations from Research

1. There should be regular and effective public health education at the antenatal care clinics to increase the knowledge of pregnant women on intestinal parasitic infections and the predisposing factors such as age and gynaecological characteristics.

2. Routine stool examination should be carried out for every pregnant woman particularly those with lower age, those in their second and third trimesters as well as those having their first pregnancies since they represent the most vulnerable group.

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## **APPENDICES**

### **APPENDIX 1: INFORMED CONSENT**

#### **Title of study**

Prevalence of intestinal parasitic infections and associated risk factors among pregnant women attending antenatal care in Kasoa Polyclinic.

#### **Introduction**

I am a master's student of the Department of Biological, Environmental and Occupational Health Sciences, School of Public Health, University of Ghana, Legon. As part of the programme, we carry out research work. My work is on the intestinal parasitic infections among pregnant women and factors that predispose them to such infections.

#### **Purpose of the study**

The study aims at determining the prevalence of intestinal parasitic infections and its associated risk factors among pregnant women attending antenatal care clinic in Kasoa Polyclinic.

#### **Eligibility Criteria**

Any pregnant woman 16 years or older who seeks antenatal care services at Kasoa Polyclinic during the period of the research. Pregnant women who are already on antihelminthic drugs would be exempted from the study.

#### **Study Procedure**

A short interview will be conducted with the help of a questionnaire to obtain the contact information, age, highest educational level, stage of pregnancy, handwashing practices, defecatory practices, history of deworming as well as sources of food and drinking water. Early morning stool sample will be collected from the participant by the Principal Investigator (a Laboratory Technologist) and analysed for various intestinal parasites.

### **Risks and Benefits**

This study would not pose any risk to its respondents as clean and sterile materials would be used for testing for the presence of intestinal parasitic infections among the pregnant women. The potential risk that may arise is during the stool sample collection stage where the study participants may infect themselves with parasitic agents from the toilet if hands are not washed. In view of that, the researcher would provide toiletries (toilet roll, soap and hand sanitizer) to participants that use the toilet facility. The study participants may spend about 30 minutes in answering questionnaires and stool sample collection for onward testing of the various intestinal parasitic infections. Study participants who would want to know the outcome of their test would have to not more than an hour.

The study would provide the study participants an opportunity to test for the presence or absence of intestinal parasitic infections. Again, it would afford them the chance to seek early treatment should there be any parasitic infection among them.

### **Voluntary Participation/Withdrawal**

Informed written and verbal consent will be sought from the study participants before inclusion in the study. The study objectives and procedure, as well as possible risks and benefits associated with participating in the study will be explained to the study participants in English and the local language. Research would be carried out only on those who agree to participate and satisfy the inclusion criteria. Study participants who do not seem to understand the study upon several explanations would be excluded from the study. All responses would be kept confidential.

### **Privacy and Confidentiality**

Privacy and confidentiality of the respondents will be ensured at all stages of the study. Questionnaires designed for the study would not make use of names but rather serial numbers. Again, the questionnaires would be administered to the study participants individually in an enclosed room. Finally, the outcome of the laboratory testing would be kept strictly confidential.

**Data Storage and Protection**

Materials for the study that contains information on study participants would be kept strictly by Principal Investigator. The data obtained from the study would be cleaned and entered into Stata SE version 15 (64bit) software with the identification numbers and electronic files would be made available only to the research team.

**Declaration of Conflict of Interest**

I, Albert Abaka-Yawson (Principal Investigator), declare that to the best of my knowledge there are no conflict of interest will or may arise as a result of my involvement in the study.

**Who to Contact**

All questions and suggestions regarding the research can be wired to:

- GHS/ Ethical Review Committee administrator, Hannah Frimpong  
Mobile Number: 0507041223
- School of Public Health, University of Ghana, Legon
- Albert Abaka-Yawson (Principal Investigator)  
Mobile Number: 0241453096/ 0578387338  
Email: [aabakayawson@uhas.edu.gh](mailto:aabakayawson@uhas.edu.gh)

**Before taking Consent**

Do you have any questions you wish to ask concerning the study?

Yes [ ] No [ ] If Yes, Please specify .....

**Statement of Consent**

I ....., declare that the purpose, procedures to be followed, risks and benefits of the study have been read / explained and every question (s) have been answered to my satisfaction. I hereby give consent to participate in this study.

Signature / Thumbprint of participant..... Date: .....

**Statement by the Researcher**

I, undersigned, have explained the consent form to the subject in the language that she understands on information relating to the study. I agree to answer any future questions concerning the study and also adhere to the approved protocol.

Signature.....

Date: .....

**APPENDIX 2: QUESTIONNAIRE**

My name is ..... from the School of Public Health, University of Ghana. We are seeking your assistance in undertaking an important scientific study on the prevalence of intestinal parasitic infections and associated risk factors among pregnant women in Kasoa.

The study will provide you with useful information on parasitic infection status. Your participation is very vital to the success of the study. All information you provide will be treated with utmost care and will not be used for any other thing except for research purposes. Confidential information provided will be kept as such and made accessible only to the research team.

We would administer a questionnaire and also take stool sample from you. Please feel free to skip any question in the form or stop at any point of the interview/ procedure.

Thank you for agreeing to participate in this research work.

Respondent's ID Number.....

**SECTION A: GENERAL INFORMATION**

1. Participant's Identification Number: .....
2. Contact Information : .....
3. Name of Interviewer : .....
4. Date of Interviewer : .....
5. Place of Interviewer : .....

**SECTION B: BIODATA OF RESPONDENTS**

1	Which age group do you belong to?	16-20yrs <input type="checkbox"/>	21-25yrs <input type="checkbox"/>	26-30yrs <input type="checkbox"/>	
		31-35yrs <input type="checkbox"/>	36-40yrs <input type="checkbox"/>	41-45yrs <input type="checkbox"/>	
		46-50yrs <input type="checkbox"/>			
2	Formal education	None <input type="checkbox"/>	Primary <input type="checkbox"/>	J.S.S <input type="checkbox"/>	S.S.S <input type="checkbox"/>
3	Marital status	Single <input type="checkbox"/>	Married <input type="checkbox"/>		
4	Employment of respondents	Unemployed <input type="checkbox"/>	Employed <input type="checkbox"/>		

**SECTION C: PERSONAL FACTORS THAT MAY PREDISPOSE RESPONDENTS TO STUDY OUTCOMES**

5	Is this your first pregnancy?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
6	What stage of pregnancy are you in?	1 <sup>st</sup> trimester <input type="checkbox"/>	2 <sup>nd</sup> trimester <input type="checkbox"/>	
		3 <sup>rd</sup> trimester <input type="checkbox"/>		
7	What type of toilet facility do you use?	Pit latrine <input type="checkbox"/>	W. C <input type="checkbox"/>	Public toilet <input type="checkbox"/>
8	Do you share the toilet facility with others?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
9	Do you wash your hands after defecation?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Sometimes <input type="checkbox"/>
10	What is your major source of feeding?	Prepare food at home <input type="checkbox"/>	Buy food outside <input type="checkbox"/>	
11	Do you wash your hands before and after eating?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
12	If yes, with what?	Soap and water <input type="checkbox"/>	Water only <input type="checkbox"/>	
13	What is your main source of drinking water?	Pipe-borne water <input type="checkbox"/>	Borehole <input type="checkbox"/>	
		Well <input type="checkbox"/>	River/ Stream <input type="checkbox"/>	Sachet <input type="checkbox"/>
14	When was your last deworming date?	<=3 months <input type="checkbox"/>	4-6 months <input type="checkbox"/>	7-11 months <input type="checkbox"/>
		>=12months <input type="checkbox"/>	Not at all <input type="checkbox"/>	
15	Has any deworming exercise been organized in the community recently?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	

**APPENDIX 3: MEDICAL REFERRAL FORM**

Date: .....

Patient Name:.....

Patient's Date of Birth:.....

Dear Dr .....

**REFERRAL**

The above named client recently participated in a research work where stool samples were collected for analysis for various parasites. The following abnormalities were noted in her laboratory results;

**Parameter and Abnormalities Identified**

We are therefore referring her to your facility for appropriate medical care. We are most grateful for your assistance.

Sincerely,

Albert Abaka-Yawson  
Principal Investigator  
School of Public Health  
University of Ghana