

# Prevalence of hookworm infection: A retrospective study in Kumasi, Ghana

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**Abstract:** Introduction- Epidemiological information such as trends of prevalence of hookworm infection is a prerequisite to developing and/or sustaining control strategies. Objective- This study specifically sought to establish the prevalence of hookworm infection among patients who reported at the Parasitology Laboratory of the Komfo Anokye Teaching Hospital (KATH) for intestinal parasitic investigation. Method- A retrospective study conducted covered available data from January 2001 to December 2011. Records of patients referred to the Parasitology Laboratory of the hospital were manually reviewed for hookworm infection. Data on age, sex and status of hookworm infection (either present or absent) were retrieved and analyzed using Microsoft excel 2007 statistical package. Results- A total of 47147 patients reported at the laboratory for intestinal parasitic investigations. Out of this number, 158 were hookworm positive, representing an overall prevalence of 0.3% (158/47147). Among the positive cases, the study revealed that the proportion of individuals in age groups <1, 1 to 9, 10 to 19, 20 to 29, and 30 to 39 years infected were 1.3%(2), 10.8%(17), 16.5%(26), 27.2%(43) and 23.4%(37) respectively. However, the proportion of patients in age groups 40 to 49, 50 to 59 and ≥60 years infected were 8.7%(14), 5.7%(9) and 7.0%(11) respectively. Among the infected patients 62.7% (99) were females while 37.3% (59) were males. The yearly prevalence rate dropped consistently from 0.8% in 2001 to 0.1% in 2005. It however increased marginally in 2006 (0.3%) and dropped to 0.0% in 2011. There were indications of seasonal variation regarding the monthly prevalence rates of hookworm infection. Conclusion- The overall prevalence of hookworm was relatively low among the study population. However, the study suggests that hookworm infestation is generally high between April and August.

**Keywords:** Hookworm, Infection, Prevalence

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## 1. Introduction

Hookworm is a parasitic nematode that lives in the small intestines of its hosts, mostly mammals such as dogs, cats, and human. Two species of hookworm commonly infect human: *Ancylostoma duodenale* and *Necator americanus*. They are voracious blood feeders of the nematode world [1, 2].

The most significant risk of hookworm infection is anaemia, secondary to loss of iron and protein in the gut [3]. It has been estimated that a single *Ancylostoma duodenale* ingests about 150 µL of blood per day while *Necator americanus* sucks about 30 µL [4]. However, the blood loss through this channel cannot be visualized with the naked eye.

In a situation where the worm burden is significantly high in an individual, infection is normally severe with iron deficiency anaemia, particularly in people with inadequate iron reserves or intake. In most developing countries for instance, anaemia in pregnancy has been associated with worm infestation, especially hookworm [5].

Worldwide, *Necator americanus* is the predominant aetiological agent of human hookworm infection, whereas *Ancylostoma duodenale* is somehow restricted geographically [6, 7]. Most infected individuals are concentrated in sub-Saharan Africa and Eastern Asia/the Pacific Islands with each region having estimates of 198 million and 149 million infected individuals respectively [8,9].

Majority of these infected individuals live in poverty-stricken areas with poor environmental sanitation [10]. It is estimated that about 3,000 to 65000 deaths occur from hookworm related diseases annually worldwide [11, 12].

In Ghana, the Ministry of Health and the Ghana Health Service with the help of development partners put in place a Neglected Tropical Diseases Control Programme (NTDCP). The ultimate objective of the programme was to reduce Neglected Tropical Diseases (NTD) of which hookworm is no exception to a level that they will no longer be of public health significance by the year 2015 [13]. The target groups have generally been school children, young people and pregnant women. The current study focused on using available data at the Parasitology Laboratory of the Komfo Anokye Teaching Hospital to establish the prevalence of intestinal parasitic infection, particularly hookworm in the Kumasi metropolis.

## 2. Materials and Methods

### 2.1. Study Design and Site

This retrospective study was conducted at the Parasitology Laboratory of the Komfo Anokye Teaching Hospital (KATH). The hospital is located in Kumasi, the traditional and administrative capital of the Ashanti Region. Kumasi is about 170 km North West of Accra, the national capital. The Komfo Anokye Teaching Hospital hospital is accredited for postgraduate training in surgery, obstetrics and gynecology, otorhinolaryngology, ophthalmology, radiology, and other Allied Health programmes by the West African College of Surgeons. It currently has about 1000 beds capacity and serves as a referral hospital for the Ashanti, Brong-Ahafo and Western regions of Ghana.

### 2.2. Data Extraction and Analysis

All records of patients referred to the Parasitology Laboratory of the Komfo Anokye Teaching Hospital, from January 2001 to December 2011 were manually reviewed for hookworm infestation. Confirmation of the presence or the absence of intestinal parasite by the laboratory is based on microscopic examination of stool specimen using the direct wet mount technique as described by Cheesbrough [14]. Data on age, sex and status of hookworm infection were entered into and analysed using Microsoft excel 2007 statistical package.

## 3. Results

### 3.1. Yearly Distribution of Hookworm Cases

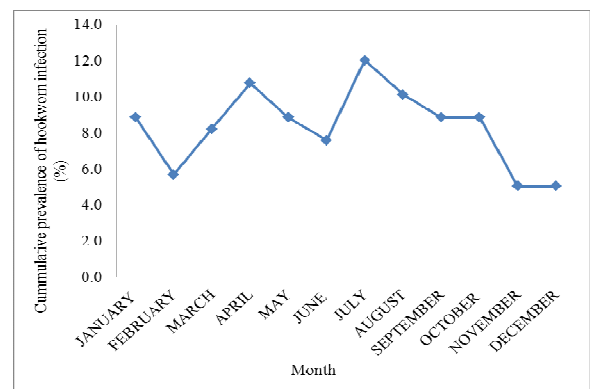
In total, 47147 patients were investigated for various intestinal parasitic agents during the period under review. Out of this number, 0.3% (158) were infected with hookworm. The highest prevalence was observed in 2001 0.8% (45/5340) while no positive case of hookworm was recorded in 2011 (Table 1).

**Table 1.** Yearly distribution of positive cases of hookworm infection

Years	Positive hookworm cases	Total number of cases	Prevalence (%)
2001	45	5340	0.8
2002	35	5100	0.7
2003	22	4840	0.5
2004	11	3800	0.3
2005	4	3780	0.1
2006	12	4520	0.3
2007	12	4600	0.3
2008	9	3710	0.2
2009	7	4107	0.2
2010	1	3900	0.0
2011	0	3450	0.0
TOTAL	158	47147	0.3

### 3.2. Cumulative Monthly Distribution of Hookworm Cases

The cumulative monthly distribution of hookworm cases from 2001 to 2011 revealed that the number of positive cases was relatively higher in April 10.8% (17/158) and August 10.1% (16/158) with peak infection seen in July 12.0% (19/158). The rest of the months however showed varied distribution of hookworm positivity (Figure 1).



**Figure 1.** Cumulative monthly distribution of hookworm cases from 2001 to 2011.

### 3.3. Age and Gender Distribution of Hookworm Infection

Among the positive hookworm cases, infection was relatively higher in patients of age 10 to 39 years. Patient aged 40 years and above recorded prevalence not exceeding 8.9%. However, the least infected group were patients below one year. More females were infected than male (Table 2).

**Table 2.** Age and gender distribution of hookworm infection

AGE(Years)	Male (%)	Female (%)	Total (%)
<1	1(50.0)	1(50.0)	2(1.3)
1 – 9	6(35.3)	11(64.7)	17(10.8)
10-19	12(46.2)	14(53.8)	26(16.5)
20-29	18(41.9)	25(58.1)	43(27.2)
30-39	10(27.0)	27(73.0)	37(23.4)
40-49	4(28.6)	9(64.3)	14(8.9)
50-59	5(55.6)	4(44.4)	9(5.7)
≥60	3(27.3)	8(72.7)	11(7.0)
TOTAL	59(37.3)	99(62.7)	158(100.0)

## 4. Discussion

The current study focused on establishing the prevalence of hookworm among patients who visited the Parasitology Laboratory of the Komfo Anokye Teaching Hospital between 2001 and 2011. The period under review saw a total number of 47147 patients reporting to the Laboratory for intestinal parasitic investigations. Out of this number, 0.3% (158) positive cases were recorded. The current year on year prevalence of hookworm infection recorded is relative low compared to studies conducted in Babile, eastern Ethiopia and Waikagul, which recorded 6.7% and 18.5% respectively [15, 16]. There are reports that the disease is predominant among farming communities [11], a practice seemingly minimal in urban areas; hence the generally low prevalence observed.

The cumulative monthly distribution of hookworm cases from 2001 to 2011 revealed that the number of positive cases was high in April 10.8%(17/158), August 10.1%(16/158) and July 12.0%(19/158). April to August is the period in the year where farming activities are intensive, and individuals especially farmers are at higher risk of being infected with hookworm [17]. The ambient condition this period provides is conducive for the eggs of hookworm to hatch and develop into the infective form [18]. The results confirmed similar works which established the fact that seasonal variations affect the infectivity of hookworm [19-20].

Prevalence and intensity of hookworm infection have been associated with age and sex [21]. However, there appears to be considerable variation in the age-intensity profile of hookworm infestation in the current study. The study revealed that individuals less than 40 years are frequently infected with hookworm. This observation agrees with existing findings that prevalence of hookworm is high among younger people [22-24]. The high prevalence seen among individuals within the age bracket 10 to 39 years could be attributed to the fact that they are physically active and are more likely to be involved in activities such as farming and other manual works which predispose them to hookworm infection [25, 26]. There are, however, reports that suggest that hookworm infection in the elderly could be relatively high [27, 28], as observed in the study.

Even though some studies have reported non-significant association between sex and hookworm infection [29, 30], the findings in this study showed otherwise as more females 62.7% (99) were infected than males 37.3%(56). However, this confirms work done by Akinbo *et al.*, who reported high hookworm infection among females [19]. Cultural and social biases in behaviour and occupation have been established as risk factors influencing hookworm infection prevalence rates in males and females [31, 32]. The skewness in prevalence towards females results from the bias in the study since greater number of the stool samples investigated came from pregnant women who report to the laboratory for routine stool examination.

## 5. Conclusion

The study revealed that hookworm infestation among patients who reported at the Parasitology Laboratory of the Komfo Anokye Teaching Hospital from 2001 to 2011 is relatively low. However the prevalence of the disease was higher in females than males. Hookworm positivity was relatively high between April and August, and peaked in July.

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