A Retrospective Study on Association between Symptoms and Laboratory Diagnosis of Intestinal Parasites among Patients Visiting Kenyatta National Hospital

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Registration NO: W64/72331/08

Project Report Submitted in Partial Fulfilment of Master of Science in Tropical and Infectious Diseases

DECLARATION

This project is my original work and has not been presented for a degree in any other university.

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Dedication

I dedicate this project to my parents, Charles Kahumburu and Dorcas Kahumburu, and to my husband Martin Wachira for giving me unsolicited material and emotional support.

Acknowledgement

I am grateful to my supervisors Dr H. Kariuki Njaanake and Dr. Peter Mwathi for their guidance and support throughout the process of this study and dissertation preparation.

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I will always remember my colleagues in the Msc TID class with whom we shared the challenges of postgraduate studies. Many times we shared critical information in discussion groups, when doing assignments and preparing for continuous assessment tests and end module exams.

Last but not least, I acknowledge my parents and husband for their never ending social and emotional support.

LIST OF ABBREVATIONS

OP No……………………………………………………………….Outpatient Number

IP No…………………………………………………………………..Inpatient Number

UoN……………………………………………………………University Of Nairobi

KNH……………………………………………………………Kenyatta National Hospital

Contents

ABSTRACT

Background: Intestinal parasitic infections are the most common parasitic infections affecting man and can result in important morbidity or mortality in infected individuals. Intestinal parasites are common in resource-poor communities where they are also associated with considerable economic loss. These infections are persistent among these communities partly due to obstacles that militate against control efforts. These are such as inadequate knowledge of the distribution, demographic and environmental variables that influence the prevalence of infection in endemic areas. This study aimed at determining the prevalence of the intestinal parasites among the patients visiting Kenyatta National Hospital, the symptomatology of the patients and assess the distribution and demographic variables of these individuals.

OBJECTIVE: To assess the distribution and association between intestinal parasites and intestinal symptoms among patients visiting Kenyatta National Hospital.

METHODS: This was a retrospective cross-sectional study that involved the review of laboratory reports on intestinal parasites at KNH parasitology laboratory from 1st January 2008 to December 2012. The study was conducted at Kenyatta National Hospital, Nairobi. A sampling frame consisting of 2,960 laboratory reports was used to obtain a sample of 360 individuals after random sampling of the complete records. The sample records were reviewed for demographic data, stool microscopy outcomes and area of residence. The patient outpatient number was then used to obtain the card of the patient which was then analysed for the presenting complaints of the patient.

RESULTS: From the 360 reports reviewed all the patients presented with abdominal symptoms such as diarrhoea, vomiting, abdominal bloating and abdominal pains. Most of the patients (38.2%) had diarrhoea as the chief complaint, of these 7.2% tested positive for

intestinal parasites. Twenty nine percent of the patients presented with abdominal pains and bloating with 7.0% of them testing positive for intestinal parasites. About 20.3% of the patients presented with abdominal pain and diarrhoea with 8.6% being positive for intestinal parasites and 12.5% presented with diarrhoea and vomiting with only 2% being positive for intestinal parasites. Laboratory results revealed that overall, 23.4% of the patients in the sample were infected with intestinal parasites.

Conclusion

Patients presenting with abdominal symptoms to the hospital could be suffering from different ailments. This study indicates that majority of the patients who presented to the hospital with intestinal symptoms did not necessarily suffer from intestinal parasites with 76.6% of the patients testing negative for ova and cysts while 23.4% tested positive. Almost all the patients who presented with intestinal parasites had protozoal infection and majority were more than 10 years of age. It is therefore important to investigate for other causes of acute diarrhea for example bacteria and viruses.

CHAPTER ONE

INTRODUCTION /LITERATURE REVIEW

Intestinal helminthes and protozoan infections have been recognized as significant causes of illnesses and diseases worldwide [1]. These are among the most common human parasitic infections and have been associated with important morbidity and economic loss in endemic areas [2]. Current estimates show that at least more than one quarter of the world's population is chronically infected with intestinal parasites and most of the infected individuals live in developing countries [3]. The prevalence of intestinal parasitic infections is 50% in developed countries, whereas it reaches up to 95%in some developing countries [4].

These infections are usually highly prevalent among the resource poor and socioeconomically deprived communities where overcrowding, poor environmental sanitation, low level of education and lack of access to safe water are prevalent [5]. The infected people experience a vicious cycle of under nutrition and repeated infections leading to excess morbidity with children being the worst affected [6].

For example soil transmitted helminthes (*Ascaris lumbricoides*, *Trichuris trichiura* and hookworm) have been recognized as an important public health problem and are the most prevalent of intestinal parasitic infections among poor communities [7,8]. In 2009, *Hotez et al.,* estimated that approximately one third of the world population is infected with at least one species of soil transmitted helminthes, with *A. lumbricoides* infecting 800 million people, *T. trichiura* 600 million, hookworm 600 million and resulting in up to 135,000 deaths annually [9].

With regards to intestinal protozoan infections, giardiasis caused by *Giardia intestinalis*, is the most prevalent protozoa infection with estimated prevalence rates ranging from 2 to 7% in developed countries but 20 to 30% in most developing countries and affecting

approximately 200 million people worldwide [10]. Amoebiasis caused by *Entamoeba histolytica* is another important pathogenic protozoa affecting approximately 180 million people resulting in a reported annual mortality rate of 40,000 to 110,000 [11].

Intestinal parasitic infections cause various intestinal symptoms including abdominal bloating, cramps, constipation, diarrhoea, lack of appetite and vomiting [12]. Most of these symptoms are non-specific and are similar to those of other pathogens such as viruses, bacteria and other non-infectious conditions affecting the intestinal system including irritable bowel syndrome, ulcerative colitis, pancreatitis and peptic ulcer disease [12]. Diagnosis of parasites is laboratory based where stool is examined for ova, cysts or trophozoites.

A study by Masucci *et al*., showed that a significant proportion of patients visiting a hospital in Italy were infected with more than one species of intestinal parasites [13]. In this study only 8% of those infected were symptomatic suggesting that many infected patients go untreated even if they visit hospitals if proper clinical or laboratory diagnosis is not done. This is important as these asymptomatic individuals may act as an important reservoir for continued transmission in their communities or develop symptoms later.

Hospital based studies carried out to determine the prevalence of intestinal parasites in symptomatic patients have revealed that protozoa infections are more prevalent in this group of individuals. In Ethiopia a retrospective study revealed that *E. histolytica* and *G. lamblia* were the most prevalent intestinal parasites with 36.1% and 11% prevalence, respectively [14]. In India a hospital based retrospective study done by Shrihari *et al.,* found the prevalence of the protozoa infections to be higher than that of helminths with *E. histolytica* leading with a prevalence of 43.9%[15], while in Saudi Arabia Zaglool *et al.,* found the prevalence of *E. histolytica* as 4.7% out of the overall prevalence of intestinal parasites of 6.2% [16].This could be due to the symptomatic nature of protozoan intestinal parasites as

compared to the soil transmitted helminths which are normally asymptomatic except in heavy infections [12].

Several studies carried out in Kenya indicate that the general population is at risk of infection with intestinal parasites. For instance, Nyarango *et al.,* in Kisii municipality, reported 65.5% and 75.9% prevalences of parasites in meat and vegetables respectively and about half of the food handlers surveyed at the municipal hospital had one or more parasitic infections [17]. A study by Kamau *et al.*, on the prevalence of intestinal parasitic infections in certified food-handlers working in food establishments in Nairobi city showed that 15.7% had different species of parasites with *E. histolytica* being the most prevalent [18]. Prevalences of 12.9%, 6.4%, 4.6%, 1.5% and 0.4% for *A. lumbricoides, T. trichiura*, hookworm and *S. mansoni* infections respectively, have also been reported among primary school children in Nairobi [19].

Intestinal parasites are common in areas with poor sanitation, dirty water, substandard crowded housing and in warm and humid environments [20]. In 2008 the World Bank estimated that 1.29 billion people were living in absolute poverty, 47% of whom were in sub-Saharan Africa [21]. These figures correlate with the high prevalences of helminth infections in the region [22]. In Kenya, depending on the city, 60-80% of Kenyan urban population lives in slums that are characterized by lack of access to water and sanitation, lack of adequate housing and poor environmental conditions which are predisposing factors for infections with intestinal parasites [23]. For instance in Nairobi, 60% of the population lives in slums that occupy only 5% of the total land area [23]. Kibera is a slum in Nairobi where it has been demonstrated that, poor environmental sanitation leads to water and vector borne diseases including intestinal parasites [23]. Although entire populations in such areas are at risk, children carry the greatest burden of infection due to their behavioural and biological

exposure [7]. For example, children tend to play in contaminated environments and are immunologically vulnerable to infections. They also are normally crowded together for large periods of time for example in schools, orphanages or slums, thereby increasing the likelihood of transmission or environmental contamination with the parasite [7, 24]. In agreement with this, in the year 2006 it was estimated that of the 181 million school-aged children in sub-Saharan Africa, almost half (89 million) were infected with one or more of these parasitic worms [9, 22].

In general and compared to the intestinal nematodes, the epidemiological data for intestinal protozoa, cestodes and trematodes excluding schistosomiasis, is limited and has not been studied systematically or included in the studies on global burden of disease [20]. Accurate figures for the prevalence of these infections have been challenging to obtain, and despite their relative low frequency compared to the nematodes, they can cause significant morbidity and mortality in a large number of individuals [20].

This study aimed at determining the prevalence of intestinal parasites in patients visiting Kenyatta National Hospital. It also assessed the association between the intestinal symptoms and the presence of intestinal parasites. The study would aid the clinician on the likely differential diagnoses for the patients based on presentation and age. This is important because Kenyatta National Hospital attends to patients from the middle and low income socio-economic groups living in planned and unplanned residential areas in Nairobi, as a result, some patients are not able to afford the laboratory tests and empirical treatment is then given to these patients. This study focused on intestinal protozoa such as *G. lamblia, E. histolytica* and soil transmitted helminths (*T. trichiura, A. lumbricoides* and hookworms).

JUSTIFICATION

Intestinal parasites are among the most prevalent human parasites and have a major impact on the socioeconomic and health of the resource-poor communities in the world [1]. The micro-geographical distribution of these infections may significantly vary from one place to another due to different factors [25]. The parasites cause different non-specific signs and symptoms which may present difficulties in choosing an appropriate diagnostic test or empirical treatment in case no diagnostic test is immediately available. Most of the available information on these infections is obtained from field studies involving many individuals with no intention to seek for medical attention and most of whom may not show obvious specific signs or symptoms related to the infections [12]. One limitation with such information is that it does not offer a quick guide to the hospital-based clinician to relate the signs and symptoms, with which patients present, to infections with intestinal parasites. It is therefore important to generate area-specific information regarding the prevalence and, signs and symptoms of intestinal parasitic infections. A review of hospital record may provide such information. For example, a significant number of patients from different areas around Nairobi present to Kenyatta National Hospital with intestinal symptoms and a review of their records may provide important information regarding the prevalence, distribution and symptoms of intestinal parasitic infections. The present study therefore reviewed records on prevalence and distribution among patients presenting to Kenyatta National Hospital with intestinal symptoms. The results of this study will aid clinicians in making a diagnosis and the data will also contribute to the overall understanding of the epidemiology of parasites in the catchment area of the hospital.

This research study is part of a two-year Master of Science degree course in which a time limit of six months is allowed to carry out a research study and submit a dissertation. This necessitated a retrospective study which requires less time and resources.

RESEARCH QUESTIONS

1. What is the prevalence of intestinal parasitic infections among patients visiting Kenyatta National Hospital?

2. What is the association between intestinal symptoms and intestinal parasitic infections among patients visiting Kenyatta National Hospital?

PROBLEM STATEMENT

Infections with intestinal parasites present with non-specific symptoms which may often mimic infections with other pathogens such as viruses, fungi and bacteria which makes accurate clinical diagnosis or choices of diagnostic methods difficult.

HYPOTHESES

1. There is no association between intestinal symptoms and presence of intestinal parasites in patients attended to at the Kenyatta National Hospital

2. There are no spatial and temporal variations in distribution of intestinal parasitic infections in the hinterland of Kenyatta National Hospital

OBJECTIVES

General Objective:

To assess the association between intestinal parasites and intestinal symptoms among patients visiting Kenyatta National Hospital.

Specific objectives:

1. To determine the prevalence of intestinal parasites among patients with intestinal symptoms attending Kenyatta National Hospital.

2. To assess the association between intestinal symptoms and intestinal parasite infections among patients visiting Kenyatta National Hospital.

CHAPTER TWO: METHODOLOGY

Study area

The present study was carried out in Kenyatta National Hospital which is located in Nairobi, Kenya, approximately 5 km from the Nairobi Central Business District in Upper Hill Area. The hospital has a 1,900 bed capacity and attends to approximately six hundred outpatients daily with 30% of the patients being attended to at the Accident and Emergency Department. About 75% of the patients treated as outpatients and inpatients are residents of Nairobi through self-referral or referral from the public and private health centres and the Nairobi District Hospital- Mbagathi. Adults with gastrointestinal symptoms are attended to at the Accident and Emergency Department while children with similar symptoms are attended to at the paediatric filter clinic. The catchment area for Kenyatta National Hospital is Nairobi and its environs. The residential areas were divided into zones which were relative to the Central business district (CBD) with Eastern being between Mombasa road and Thika road, Northern Thika road and Waiyaki way, Western Waiyaki way and Ngong road, Southern Ngong road and Mombasa road. Most patients attended to in Kenyatta National Hospital are mainly from the middle to low income socio-economic groups living in planned and unplanned residential areas in Nairobi and its environs.

At the Accident and Emergency department patients are attended to by medical officers while at the paediatric filter clinic they are attended to by clinical officers or paediatric registrars. When a patient presents with gastrointestinal complains, stool microscopy test is ordered routinely. However, not all patients afford to take the test in which case empirical treatment is given. This frequently may result in a mismatch between the number of patients presenting with gastrointestinal symptoms and the number of stool microscopy done in the laboratory.

Study design

This was a retrospective study where data from laboratory records for parasitological examination of stool was compared in relation to age, sex, patients' complaints and area of residence of patients visiting KNH in a five year period (between 1st January, 2008 and 31st December 2012).

Laboratory methods

According to the standard operating procedure of KNH, stool samples are examined in duplicates for ova or cyst using the formal-ether concentration technique [26]. Briefly, one pea-size stool sample is collected from each patient and placed in a clean mortar containing 7ml of 10% formal-saline. The sample is homogenised and emulsified using a pestle. The suspension is filtered through a sieve into a centrifuge tube. The debris trapped on the sieve is discarded and 3ml of diethyl ether or ethyl acetate is added to the formalin solution. The tube is corked and the solution is mixed thoroughly by shaking and centrifuged at 2000 rates per minute for 2 minutes. The supernatant is discarded and the deposit is placed on a microscope slide cover-slip. The preparation is examined for presence of parasites using the x10 objective lens. Definite morphological features of ova and cysts are identified under the x40 objective. If protozoan cysts of correct size and shape can be observed, but no diagnostic inclusions can be recognized, a drop of Lugol's iodine is added to the fluid at the edge of the cover slip, and the slide is re-examined after the iodine has diffused into the fluid under the cover slip within 15 minutes of preparation and the results recorded in patient results forms and in the laboratory records book.

Inclusion criteria

For a report to be in the sampling frame it must have had data on the following.

    i.   Name

   ii.   Gender

  iii.   Age

   iv.   Residence

    v.   Outcome of the stool microscopy

Exclusion criteria

    i.   Report without a name.

   ii.   Report from stool received from self-referrals or self-requests this normally do not
          have IP No and OP No.

  iii.   Incomplete records at the laboratory and doctors cards that is age, residence and stool
          microscopy results.

Data collection

Preliminary survey of all reports for the study period was carried and 2,960 reports were
selected to be included in the sampling frame. Random Sampling of all selected reports was
done in order to obtain 360 reports. Data from the 360 reports was entered into a data
collection form (Appendix I) with the following variables: age, gender, residence and
outcome of the stool microscopy test. The patient outpatient or inpatient number in the
laboratory record book was then used to retrieve the card or file of the 360 subjects and each
card was analyzed for the symptoms which led to the ordering of the stool microscopy test.

Sampling technique

The sampling frame included only laboratory records of patients who met the inclusion criteria and whose samples were examined microscopically in the KNH parasitology laboratory. Manual scrutiny of the reports to verify completeness was carried out.

The criterion for completeness of a report:

 i.   Name of patient

 ii.   Gender

iii.   Age recorded in years.

 iv.   Stool microscopy outcome

The total of complete records which were 2,960 were obtained and systematic random sampling was used to select the records. A sampling fraction k was obtained by dividing the total number of the stool results records between 1st January 2008 and 31st December 2012' by 360. The first record was selected randomly and the rest by adding the value of k until the sample size of 360 is achieved.

K= 2960/360

 therefore

K=8.22

Data analysis

Data analysis was done using SPSS version 18 software. The data was analyzed for demographic characteristics, stool microscopy outcomes, parasites identified, area of residence of the patients and relationship between symptoms and laboratory results.

Sample size calculation

The sample size of the patients to be enrolled into the study was calculated using Fischer's equation (Naing, 2006) as follows;

$$n=\frac{Z^2P(1-P)}{d^2}$$

Where,

n=sample size or the minimum of records to be reviewed.

Z=confidence interval

P=known prevalence according to literature (In this case 36% was used based on a retrospective study done at Bale-Robe Health center, Robe town south eastern Ethiopia [14].

d=precision (in proportion of one; if 5%, d=0.05

Therefore,

n= $(1.96)^2 \times 0.36(0.64)/0.05=354$ which was rounded off to a minimum of 360 patients' records which will also be used as the denominator in calculating the overall prevalence.

Ethical consideration

It was not possible to follow the patients whose specimens were examined in KNH laboratory and whose medical records were reviewed during this study in order to give written informed consent for their participation. Waiver of informed written consent for this study was therefore requested from the University of Nairobi/ KNH ethical and research committee. Patient confidentiality was maintained by stripping the records of all personal identifiers. The reports were assigned numerical identities in the form of laboratory numbers. The report registers when not in use were kept under lock and key and were taken out from the official records place. A formal request to be allowed to use laboratory records in KNH was made to the Laboratory in-charge (Appendix II).

Knowledge generated from the study will be disseminated to the KNH/UoN Ethics and

Research Committee and to the KNH research department so that it is disseminated to the

various departments. It is hoped that recipients will use the knowledge to enhance their

diagnostic and management practices for the benefit of the patients attended to at KNH.

CHAPTER THREE: RESULTS

Three hundred and sixty laboratory reports were selected randomly from a total of two thousand nine hundred and sixty reports of patients whose stool samples were examined for ova and cysts, at the Kenyatta National Hospital from 1st January 2008 to 31st December 2012. Majority of the sampled patients were in 2009 where 94 records were sampled while the least were in 2012 with a total of 49 patients. There were missing records of November and December 2012 and many incomplete records in the same year. Table 1 outlines the annual distribution of sampled respondents.

Table 1: Annual distribution of the sampled respondents

Year	No of patients	Percent (%)
2008	82	22.8
2009	94	26.2
2010	74	20.6
2011	60	16.7
2012	49	13.6
Total	359	100

The demographic characteristics of the population showed that majority of the patients (57.7%) in the study were aged 10 years and less while 152 (42.7%) were aged more than 10 years. The mean age was 16.4 years. One hundred and ninety three (53.8%) were males and one hundred and sixty six (46.2%) females. Most of the patients (37.3%) resided in the Western region of Nairobi, 87 (24.2%) Southern, 83 (23.1%) Northern and (55)15.3% were from the Eastern region. Table 2 shows the demographic characteristics of the patients.

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Table 2: Demographic characteristics n=359

	No of patients	Percent (%)
Age groups		
≤10 yrs	207	57.7
11-20 yrs	30	8.4
21-30 yrs	44	12.3
31-40 yrs	35	9.7
41-50 yrs	22	6.1
≥51 yrs	21	5.8
Sex		
Male	193	53.8
Female	166	46.2
Residence		
Eastern	55	15.3
Northern	83	23.1
Western	134	37.3
Southern	87	24.2

All the patients in the study had gastrointestinal complains with one hundred and thirty seven patients(38.2%) complaining of diarrhoea, forty five (12.5%) patients complained of diarrhoea and vomiting, one hundred and four (29.0%) patients complained of abdominal pains and bloating and seventy three (20.3%) patients complained of abdominal pains and diarrhoea. Majority of these patients had negative results that is no ova and cysts seen on stool microscopy 275 patients (76.6%) while 21.2% (76) had protozoa, 1.7% (6) had nematodes and 0.6% (2) patients had mixed infections of protozoa and nematodes as indicated in Table 3.

Table 3: Symptoms and laboratory results

	No of patients	Percent (%)
Symptoms		
Diarrhoea	137	38.2
Diarrhoea/Vomiting	45	12.5
Abdominal pains/bloating	104	29.0
Abdominal pain/Diarrhoea	73	20.3
Laboratory results		
No eggs/cysts seen	275	76.6
Protozoa	76	21.2
Nematodes	6	1.7
Mixed infections	2	.6

The relationship between symptoms and laboratory results indicates that out of the 38.2% patients who had diarrhoea, 7.2% were positive for ova and cysts while 30.9% were negative, the 12.5% patients who had diarrhoea and vomiting 12.0% were negative for ova and cysts while 0.6% were positive, the 29.0% patients who had abdominal pains and bloating 22% were negative for ova and cysts and 7% were positive and finally the 20.3% patients who had abdominal pains and diarrhoea 11.7% were negative while 8.6% were positive. The p value was < 0.001 which indicated a significant relationship with symptoms and laboratory results. The Table 4 shows the relationship between patient symptoms and laboratory results.

Table 4: Relationship between patient symptoms and laboratory results

Symptoms	Laboratory Results		
	No eggs/cysts seen	Cysts/eggs/ larva seen	Total
Diarrhoea	111 (30.9%)	26 (7.2%)	137 (38.2%)
Diarrhoea / Vomiting	43 (12.0%)	2 (0.6%)	45 (12.5%)
Abdominal pains/bloating	79 (22.0%)	25 (7.0%)	104 (29.0%)
Abdominal pain/Diarrhoea	42 (11.7%)	31 (8.6%)	73 (20.3%)
Total	275 (76.6%)	84 (23.4%)	359 (100.0%)

p-value<0.001

In the analysis of age with symptoms most patients under the age of 10 years had symptoms of diarrhoea or diarrhoea and vomiting while above 10years had symptoms of abdominal pain with bloating or abdominal pain and diarrhoea. One hundred and seventy two (47.9%) patients under 10 years old were negative for ova and cysts while thirty five (9.7%) patients had ova or cysts seen on microscopy. In the age group of greater than 10years one hundred and three (28.7%) patients were negative for ova and cysts while forty nine (13.6%) had ova or cysts seen on microscopy. There were significant relationships between symptoms and age of patient, laboratory results and age with p values of < 0.001 and 0.001 respectively.

Table 5: Relationship between symptoms, laboratory results and age

	Age		
	<=10 yrs	**More than 10 yrs**	**Total**
Symptoms			
Diarrhoea	100(27.9%)	37(10.3%)	137(38.2%)
Diarrhoea/Vomiting	41(11.4%)	4(1.1%)	45(12.5%)
Abdominal pains/bloating	38(10.6%)	66(18.4%)	104(29.0%)
Abdominal pain/Diarrhoea	28(7.8%)	45(12.5%)	73(20.3%)
p-value			$< .001$
Laboratory Results			
No eggs/cysts seen	172(47.9%)	103(28.7%)	275(76.6%)
Cysts/eggs/larva seen	35(9.7%)	49(13.6%)	84(23.4%)
p-value			=0.001

The relationship between symptoms, laboratory results and sex showed that there was no significant relationship between sex and symptoms, and laboratory results $p > 0.05$, respectively in both cases. Therefore the symptoms and laboratory results were not influenced by sex of the patient as shown in table 6.

Table 6: Relationship between symptoms, laboratory results and sex

	Sex		
	Male	**Female**	**Total**
Symptoms			
Diarrhoea	75(20.9%)	62(17.3%)	137(38.2%)
Diarrhoea/Vomiting	28(7.8%)	17(4.7%)	45(12.5%)
Abdominal pains/bloating	54(15.0%)	50(13.9%)	104(29.0%)
Abdominal pain/Diarrhoea	36(10.0%)	37(10.3%)	73(20.3%)
p-value			0.56
Laboratory results			
No eggs/cysts seen	149(41.5%)	126(35.1%)	275(76.6%)
Cysts/eggs/larva seen	44(12.3%)	40(11.1%)	84(23.4%)
p -value			=0.77

The relationship between symptoms, laboratory results and residence demonstrated that there

was no significant relationship between residence and complaints, or residence with

laboratory results, p =0.21 and p= 0.92 respectively. Therefore neither symptoms nor

laboratory results were influenced by area of residence as shown in table 7.

Table 7: Relationship between complaints, laboratory results and residence

Complaints	Residence Eastern	Northern	Western	Southern	Total
Diarrhoea	25(7.0%)	27(7.5%)	47(13.1%)	38(10.6%)	137(38.2%)
Diarrhoea / Vomiting	7(1.9%)	9(2.5%)	13(3.6%)	16(4.5%)	45(12.5%)
Abdominal pains/bloating	11(3.1%)	28(7.8%)	46(12.8%)	19(5.3%)	104(29.0%)
Abdominal pain/Diarrhea	12(3.3%)	19(5.3%)	28(7.8%)	14(3.9%)	73(20.3%)
p-value					0..21
Laboratory results					
No eggs/cysts	41(11.4%	65(18.1%)	101(28.1%)	68(18.9%)	275(76.6%)
Cysts/eggs/larva seen	14(3.9%)	18(5.0%)	33(9.2%)	19(5.3%)	84(23.4%)
p-value					0.92

Discussion

Intestinal parasitic infections are among the most common infections worldwide. It is estimated that some 3.5 billion people are affected and 450 million are ill as a result of these infections [27]. The prevalence of intestinal parasitic infections is 50% in developed countries whereas it reaches up to 95% in developing countries. These infections are caused both by protozoa and helminthes, with diarrhea as the main clinical manifestation [4]. An important difference between infection with parasitic helminthes and infection with protozoan parasites is that, in most cases, the parasites do not increase in numbers within their hosts (exceptions for strongyloides species). Therefore, as pathology due to helminth infection is usually density dependent this parasite density and therefore degree of pathology is governed by the rate at which larval parasites enter the definitive host. This is not the case with pathogens that can divide asexually in their hosts such as bacterial, viral or protozoan parasites [28]. These are able to multiply in humans, which contributes to their survival and also permits serious infections to develop from just a single organism [29]. Therefore most of the patients who present to hospital with intestinal parasites will have protozoa infections due to the multiplication of the parasite in the intestines.

In the present retrospective study, 23.5% of the patients had intestinal parasites with majority of these presenting with diarrhea or abdominal pains and diarrhea as the main symptoms. Of these patients who had intestinal parasites 21.2% had protozoal infection while 1.7% had nematodes and two patients 0.6% had mixed infections of protozoa and nematodes. A similar study done by Shrihari *et al.*, in India showed that 24.78% of the patients visiting a tertiary hospital had intestinal parasites with the majority having protozoa. It also showed no significant difference in infection rates between males and females. These results are comparative to those of the present study where majority of the patients who tested positive

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for ova and cysts had protozoal infection and there was no statistical difference in infection prevalence between males and females.

A retrospective survey done in Ethiopia by Chala also revealed that protozoan parasites were the most prevalent intestinal parasites encountered. Most intestinal parasites were detected among individuals aged 15 years and above. These findings are comparable to those of our study which indicated a greater protozoan parasitic infections in patients more than 10 years of old. This may be due to increased behavioral exposure with age mainly involving eating improperly washed, raw or undercooked vegetables and fruits [14].

There was a low prevalence of helminth infections with only 0.6% being diagnosed to have helminthes. The finding of low prevalence in the present study could be caused by the asymptomatic nature of most helminth infections, as pathology due to helminthic infection is usually density dependent and therefore infected individuals do not seek medical attention. Consequently hospital field based study may reveal higher prevalences of these infections. For instance a study done by Mwanthi et al among primary school children in Nairobi showed prevalences of 12.9%, 6.4%, 4.6%, 1.5% and 0.4% for *A. lumbricoides, T. trichiura,* hookworm and *S. mansoni* infections respectively [19].

Another factor that could have contributed to the low prevalence rate of parasites in this study is that Kenyatta National Hospital is a referral hospital hence patients will seek treatment in other hospitals before coming to KNH.

There was no association between area of residence and presence of intestinal parasites. This shows that intestinal parasites are ubiquitous and transmission is mainly dependent on unhygienic handling of foods. The patients in this study were from the middle or low socio-economic status living in planned and unplanned residences in Nairobi. Also the parasites were noted to be found mostly among the patients who were greater than 10 years of age.

This could be due to the fact that these patients are more likely to eat food away from home as compared to the other age group of under 10 years. In the current study certain symptoms were more likely to be associated with intestinal parasites, this included symptoms of abdominal pain with bloating or diarrhea as compared to symptoms of diarrhea with vomiting.

The limitations in this study were missing laboratory records and incomplete doctor's notes. As a result a large number of files had to be assessed for completeness in order to obtain the requisite number of complete records meeting the inclusion criteria. All incomplete documents were excluded from the study.

Conclusion

The current study found that 23.4% of patients tested positive for ova and cysts with the most prevalent intestinal parasites being protozoa, among individuals with gastrointestinal symptoms who visited Kenyatta National Hospital between 1st January 2008 and 31st December 2012. Majority of the patients who had infections with intestinal parasites presented with diarrhea or abdominal pain/bloating and diarrhea as the chief complaint. Stool samples for the patients who presented with diarrhea and vomiting tested negative for ova and cysts. Patients who were more than 10 years of age were more likely to test positive for ova and cysts as compared to those under 10 years. Seventy six percent tested negative for ova and cysts, this indicates it is also important to consider other causes of acute diarrhea for example bacteria and viruses in patients presenting with intestinal symptom.

Recommendation

This was a retrospective study and as noted some laboratory records were missing and some of the doctors' notes were incomplete therefore it would be important to do a prospective study and follow up the patient in order to get the prevalence and distribution of intestinal parasites in the patients visiting Kenyatta National Hospital.

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APPENDICES

Appendix I: Data collection form

	LAB NO	IP/OP NO	AGE	SEX	STOOL M/S RESULTS	PATIENTS COMPLAINTS	RESIDENCE
1.							
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Appendix II: Letter of request to use Laboratory Records

Susan Kahumburu

UNITID

College of Health Sciences

University of Nairobi.

Laboratory In-charge,

Kenyatta National Hospital.

Dear Sir,

REQUEST TO ACCESS LABORATORY RECORDS FROM THE YEAR 2008 TO 2012

My name is Susan Kahumburu, a student at the University of Nairobi Institute of Tropical and Infectious Diseases (UNITID).

For my dissertation I would like to carry out a study on: Intestinal parasites among patients visiting Kenyatta National Hospital. A retrospective study on distribution and association symptoms and laboratory diagnosis.

This is therefore to request you to facilitate the provision of the past records from1st January 2008 to December 31st 2012 which I will need for my study.

The findings of the study will be communicated to you for dissemination.

Thank you.

Yours faithfully,

Susan Kahumburu
(Reg. No W64/72331/2008)