

بسم الله الرحمن الرحيم

**Sudan University of Science and Technology**

**College of Graduate Studies**

**Prevalence of Intestinal Protozoan Parasitic Infections in Kosti**

**Teaching Hospital - White Nile State**

**إنتشار عدوي الأوليات الطفيلية المعوية في مستشفى كوستي التعليمي- ولاية النيل الابيض**

A dissertation submitted in partial fulfillment of the requirements of M.Sc. degree  
in Medical Laboratory Science (Parasitology and Medical Entomology)

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## الآية

قال تعالى:

وَقَالَ رَبِّ أَوْزِعْنِي أَنْ أَشْكُرَ نِعْمَتَكَ الَّتِي أَنْعَمْتَ عَلَيَّ وَعَلَىٰ وَالِدَيَّ وَأَنْ أَعْمَلَ  
صَالِحًا تَرْضَاهُ وَأَدْخِلْنِي بِرَحْمَتِكَ فِي عِبَادِكَ الصَّالِحِينَ

صدق الله العظيم

سورة النمل الآية 19

## **Dedication**

To the soul of my mothers

To my father and brother

To my husband

To my best friends

To colleagues and teachers

To all patients suffering in the world

I dedicate this thesis with much love and appreciation

### *Acknowledgment*

First of all my thanks to Allah.

I wish to express my thanks and gratitude to my supervisor Dr. Tayseer Elamin Mohamed for assistance to initiation and completion of this study.

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Finally my gratitude is extended to my families for their patience, emotional and financial support.

### **Abstract**

The study was aimed to determine the prevalence of intestinal protozoan parasitic infection in Kosti Teaching Hospital in White Nile State. A cross-sectional hospital-based study was carried out from March - December 2015. A total of 150 subjects were included in this study. From them 63 (42%) were males and 87(58%) were females with age ranging between (1-75) years old of mean age  $31\pm1$  years old. Stool samples were taken from all subjects included in the study, in addition to clinical and parasitological data were obtained and recorded. The results showed that prevalence of intestinal protozoan infection in study area was 30(20%). When using direct wet examination, FECT and zinc sulphate floatation respectively the prevalence of intestinal protozoan parasitic infection were 11 (7%), 26 (17%) and 10 (7%) respectively. From 30 positive cases, 9 (6%), 7 (5%) and 13(9%) respectively were positive for *G.lamblia*, *E.histolytica* and *E.coli* respectively. The most common causative agents of intestinal protozoan infection in study area was *G.lamblia*. The study revealed that the prevalence of intestinal protozoan infection was higher in females (20.6%) than in males (19%). The prevalence was higher (20%) in the age group between 1-14 years old ( $p=0.445$ ).

## ملخص الدراسة

هدفت الدراسة لتحديد إنتشار عدوى الأوليات الطفيلية المعوية في مستشفى كوستي التعليمي في ولاية النيل الابيض. الدراسة المستعرضة نفذت في الفترة من مارس - ديسمبر 2015. وشملت الدراسة 150 شخص. من الـ 150 شخص 63 (42%) ذكور و 87 (58%) إناث و أعمارهم تتراوح بين 1-75 سنة ومتوسط أعمارهم  $31 \pm 1$  سنة. عينات الفسحة تم أخذها من جميع الاشخاص موضوع الدراسة بالإضافة للبيانات السريرية و الطفيلية تم أخذها وتسجيلها. أظهرت الدراسة أن إنتشار عدوى الأوليات الطفيلية المعوية في منطقة الدراسة 30 (20%). عند استخدام طريقة التحضير الرطب وال FECT وال Zinc sulphate floation technique علي التوالي كان إنتشار عدوى الأوليات الطفيلية المعوية 11(7%) ، 26(17%) و 10(7%) على التوالي. من الـ 30 حالة موجبة 9 (6%) ، 7(5%)، و 13 (9%) علي التوالي كانت موجبة لـ *E.histolytica* ، *G.lamblia* و *E.coli* علي التوالي . وكانت أكثر المسببات لعدوى الأوليات الطفيلية المعوية في منطقة الدراسة هي *G.lamblia* . ودلت الدراسة إن إنتشار عدوى الأوليات الطفيلية المعوية أعلي عند الاناث (20.6%) من الذكور (12%) . وكان أكثر الإنتشار في الفئة العمرية 1-14 سنه بنسبة 8(16%) ( $p=0.445$ ) .

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## **Chapter one**

### **Introduction and literature review**

## **Chapter one**

### **Introduction and Literature review**

#### **1.1 Introduction:**

The World Health Organization (WHO), (2005) ranks diarrheal disease as the second highest cause of morbidity and mortality in children in the developing world. Enteric protozoa are one case of diarrheal disease in children. Intestinal protozoa are transmitted by the fecal-oral route and exhibit life cycles consisting of a cyst stage and a trophozoite stage. The major parasitic causes of gastroenteritis are *Giardia lamblia* (*G.lamblia*), *Cryptosporidium parvum* (*C.parvum*) and *Entamoeba histolytica* (*E.histolytica*), *Entamoeba coli* (*E.coli*), *Entamoeba hartmani*, *Endolimax nana*, *Iodamoeba buetschlii* and *Balantidium coli* (*B.coli*). Parasites enter the intestine through the mouth from uncooked or unwashed food, contaminated water and hands when organisms are swallowed, they move into intestine where they can reproduce and causes symptoms (Verweij *et al.*, 2004). The cysts consist of a resistant wall and are excreted in the feces. The cyst wall functions to protect the organism from desiccation in the external environment. Unhygienic conditions promote transmission of most protozoa. Traditionally parasites have been identified by simple microscopy and serologic methods. New approaches include antigen detection and polymerase chains reaction (PCR) .

#### **1.2 Literature review:**

##### **1.2.1 Definition:**

Intestinal protozoa are unicellular eukaryotic organism distributed worldwide in the most habitats. They reproduce sexually by fusion of male and females gametocyte or asexually by binary fission . Most species are free living, but some are pathogenic causing infections range from asymptomatic to life threatening disease. Protozoa varies in size, shape and life style and are classified on the bases

of their microscopic morphology. The stage of protozoa that actively feed and multiply is called trophozoites. In some protozoa other terms are used in life cycle and some of it surrounds themselves with protective membranes (forming cyst) during exposure to hard environmental conditions (Alcamo and Warner, 2009).

## **1.2. 2 Transmissions:**

### **1.2.2.1 *E. histolytica* and *G.lamblia*:**

By faecal - oral transmission of contaminated foods and water. Transmission may also occur by flies (Chessebrough, 1987).

### **1.2.2.2 *C. parvum*:**

*C. parvum* was transmitted by ingestion of infective oocyst in water or food contaminated with faeces. By ingestion of oocyst in food or drink or from contaminated hand. (Arora and Arora, 2008).

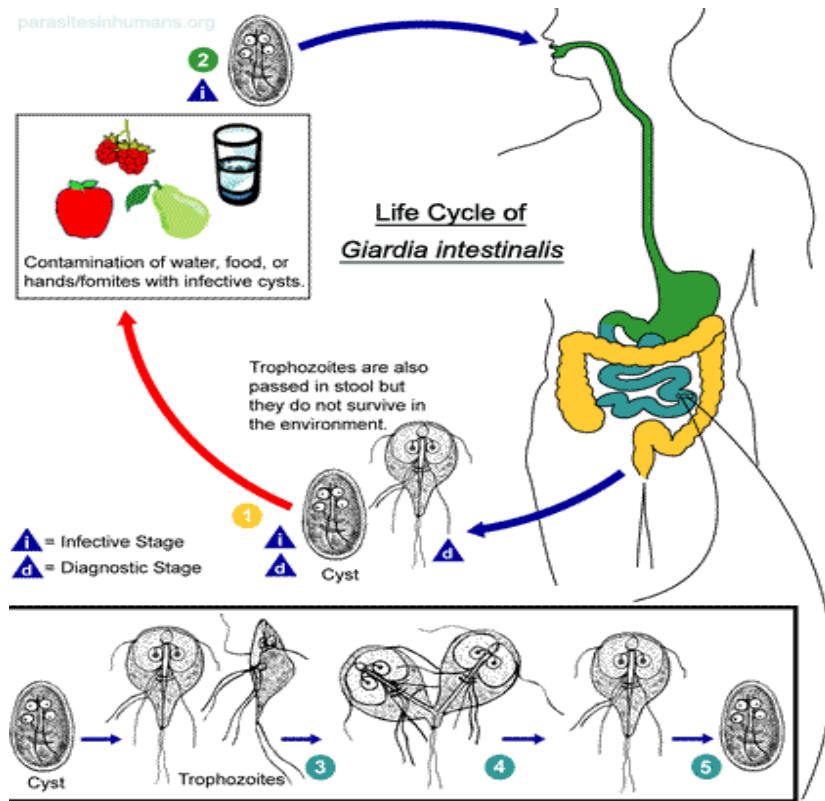
### **1.2.2.3 *B.coli*:**

Ingestion of infectious cysts in food or water or from hand contaminated (Chessebrough, 1998) .

## **1.2.3 Life cycle and morphology**

### **1.2.3.1 *E.histolytica* and *G. lamblia*:**

Following ingestion of cyst of *E.histolytica*, each cyst excysts in large intestine to produce amoebae. The amoebae from single-nucleated cyst which develop into infective cysts are excreted in the faeces. The life cycles of *G.lamblia* are similar to *E. histolytic* except it inhabits small intestine (Chessebrough, 1987) (figure 1.1, figure 1.2, figure 1.3, figure 1.4, figure1.5 and figure1.6).



**Figure 1.1: Life cycle of *G.lamblia* (WWW.parasiteinhuman.org, 2012`).**



**Figure 1.2: *G. lamblia* trophozoite in a wet mount stained with iodine. (Centers for Disease Control and Prevention, 2013).**





Figure 1.3: *G. lamblia* cyst in a wet mount stained with iodine. (Centers for Disease Control and Prevention, 2013).

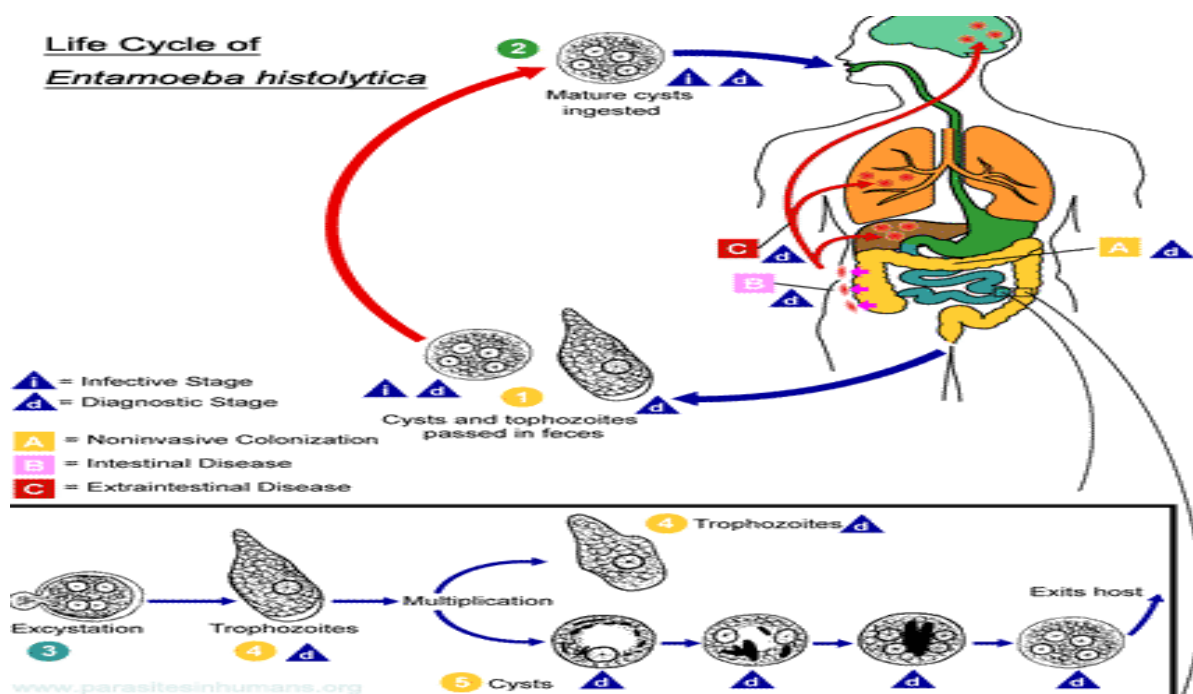


Figure 1.4: Life cycle of *E.histolytica* (WWW.parasiteinhuman.org, 2012).



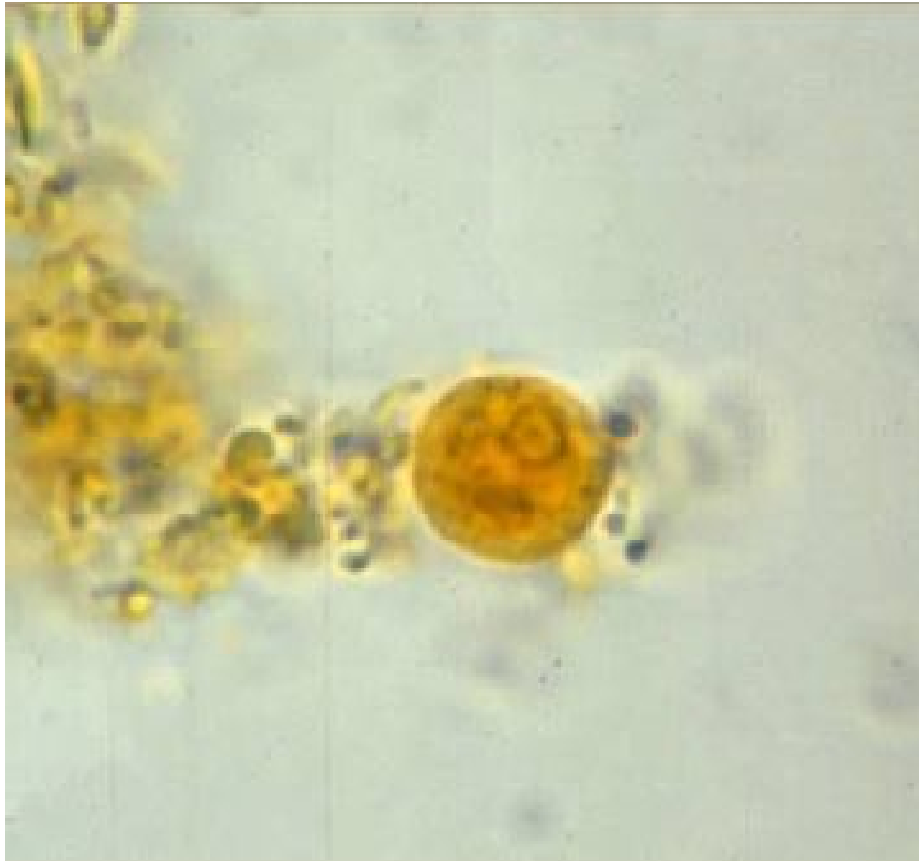
**Figure 1.5: Trophozoite of *E. histolytica* in a direct wet mount stained with iodine. (WWW.microbelibrary.org/library/parasite/2943-entamoeba-histolytica-cyst and trophozoite, 2012).**



**Figure 1.6: Cyst of *E. histolytica* in a concentrated wet mount stained with iodine. Notice the chromatoid body with blunt, rounded ends (arrow). (WWW.microbelibrary.org/library/parasite/2943-entamoeba-histolytica-cyst and trophozoite, 2012).**

### **1.2.3.2 *Entamoeba hartmani*:**

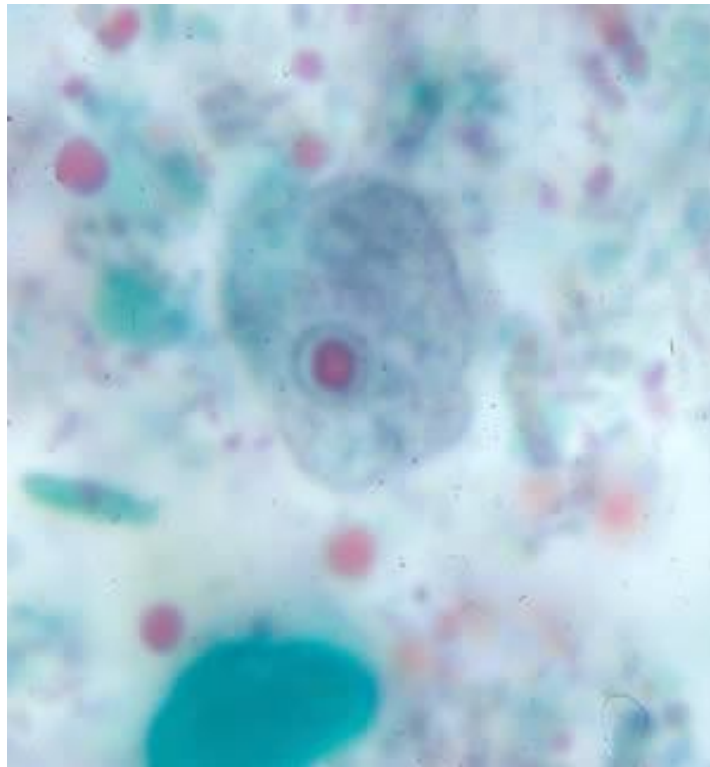
Historically it has been called small race of *E. histolytica*. It is cosmopolitan in distribution. The trophozoites varies in size from 4um to 12um and cyst from 5um to 10um. It is a commensal parasite (figure 1.7).



**Figure 1.7: Cyst of an *E. hartmani* in a wet mount, stained with iodine (Centers for Disease Control and Prevention. 2013).**

### **1.2.3.3 *Endolimax nana*:**

It was first given species designation by Wenoyon and o.conner. The trophozoites is 6-15um on diameter often have atypical nuceli that contain atriangular chromatin mass (figure1.8).



**Figure 1.8: Trophozoite of *E. nana* stained with trichrome (Centers for Disease Control and prevetion.2013).**

#### **1.2.3.4 *Iodamoeba buetschlii*:**

The natural habitat is the lumen of the large intestine, the principal site probably being the caecum. The trophozoite feeds on enteric bacteria; it is a natural parasite of man and lower primates. It is generally regarded as a non pathogenic lumen parasite. No treatment is ordinarily indicated. Prevention is based on good personal hygiene and sanitation in the community(Assafa *et al.*, 2004)

#### **1.2.3.5 *E. coli*:**

The life cycle stages include; trophozoite, precyst, cyst, metacyst, and metacystic trophozoite. Typically the movements of trophozoites are sluggish, with broad short pseudopodia and little locomotion, but at a focus the living specimen can not be distinguished from the active trophozoite of *E.histolytica*. However, the cysts are remarkably variable in size. *E. coli* is transmitted in its viable cystic stage through faecal contamination. *E.coli* as a lumen parasite is non-pathogenic and produces no symptoms. The mature cyst (with more than four nuclei) is the distinctivestage to differentiate *E.coli* from the pathogenic *E.histolytica*. Specific treatment is not indicated since this amoeba is non-pathogenic. The presence of *E.coli* in stool specimen is evidence for faecal contamination. Prevention depends on better personal hygiene and sanitary disposal of human excreta (Assafa *et al.*, 2004).

#### **1.2.3.6 *C. parvum*:**

It was acquired by ingesting the oocyst; the oocyst contains four sporozoites which are released in the intestine. They infect the intestinal epithelial cells, remaining just within the brush border. There they develop into the trophozoites, which undergo asexual multiplication (schizogony) and release merozoites. These in turn infect the neighboring epithelium cells and repeat schizogony. Some develop into micro- and macrogamete. After fertilization, the zygote develops into the oocyst, which shed in feces (Ryan and Rayan, 2010) (Figure1.7 and figure1.8).

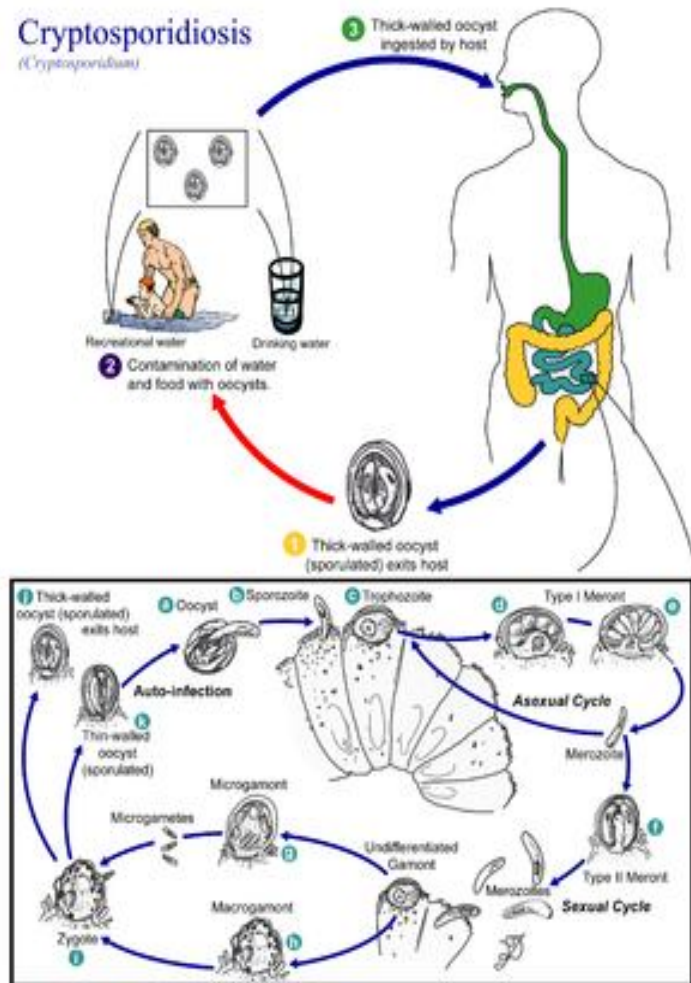
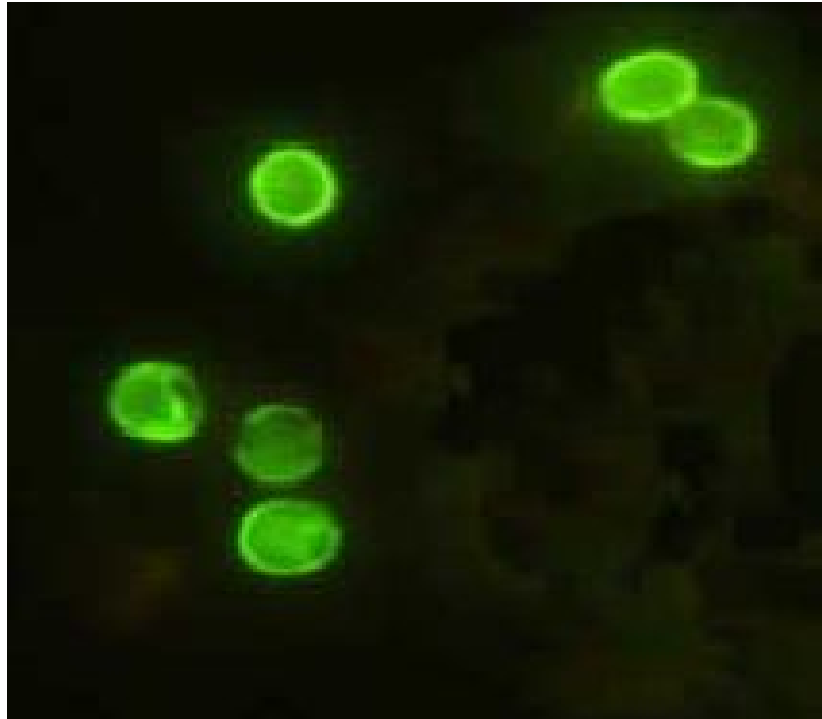


Figure 1.9: Life cycle of *C. parvum* (<https://web.stanford.edu/class>, 2003).

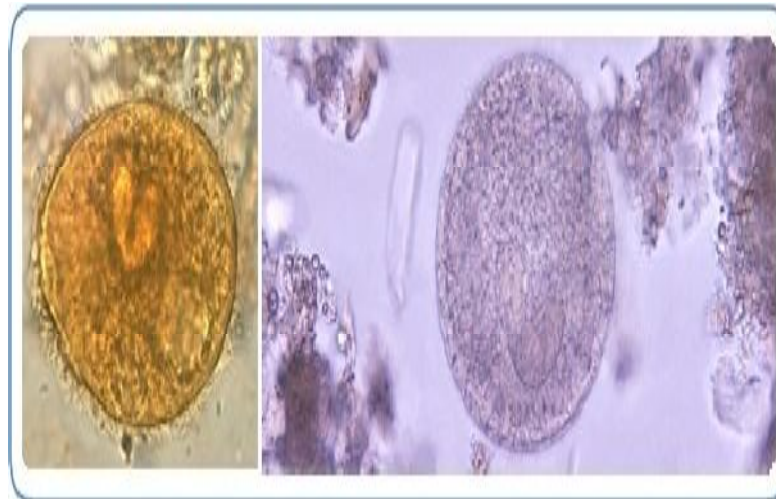


**Figure 1.10: Oocyst of *C. parvum* (<https://en.wikipedia.org/wiki/Cryptosporidiosis>, 2013).**

#### **1.2.3.7 *B. coli*:**

Has 2 developmental stages: a trophozoite stage and a cyst stage. The cyst is the infective stage of *Balantium coli* life cycle. Once the cyst is ingested via feces-contaminated food or water, it passes through the host digestive system. The tough cyst wall allows the cyst to resist degradation in the acidic environment of the stomach and the basic environment of the small intestine until it reaches the large intestine. There, excystation takes place. Excystation produces a trophozoite from the cyst stage. The motile trophozoite then resides in the lumen of the large intestine, feeding on intestinal bacterial flora and intestinal nutrients. Trophozoites multiply by asexual binary fission or sexual conjugation (with the exchange of nuclear material). The trophozoite may become invasive and penetrate the mucosa of the large intestine. Trophozoites are released with the feces, and encyst to form new cysts. Encystation takes place in the rectum of the host as feces are

dehydrated or soon after the feces have been excreted. Cysts in the environment are then ready to infect another host (figure 1.11) (Chessebrough, 1998).



**Figure 1.11: Cyst of *B.coli* (WWW. Parasite in human.org, 2012)**

#### **1.2.4 Pathology and symptomatology:**

##### **1.2.4.1 *E. histolytica*:**

*E. histolytica* causes abdominal pain and acute attacks of dysentery with blood and mucus in the feces. The outcome of infection may result in a carrier state, intestinal amoebiasis, or extra-intestinal amoebiasis. Diarrhoea, flatulence, and cramping are complaints of symptomatic patients. More severe disease is characterized by the passing of numerous bloody stools in a day. Systemic signs of infection (fever, leukocytosis, rigors) are present in patients with extra intestinal amoebiasis (Assafa *et al.*, 2004).

##### **1.2.4.1.1 Hepatic abscess:**

The liver is primarily involved, because trophozoites in the blood are removed from the blood by the portal veins. The right lobe is most commonly involved, thus pain over the liver with hepatomegaly and elevation of the diaphragm is observed. When intestinal amoebic ulcer reaches blood vessels, amoeba may enter the blood stream and be carried to liver where they can form an abscess. Abscesses are



localized to the upper outer quadrant of right lobe of liver. This localization result in the development point tenderness, wasting and a fever associated with chills and night sweat (Ryan and Rayan, 2010).

#### **1.2.4.2 *G. lamblia*:**

Can cause abdominal pain, severe diarrhoea, vomiting, and weight loss and stool specimens are offensive and pale in color. Intestinal malabsorption particularly of fat and carbohydrates. Disaccharides deficiency with lactose intolerance altered level of intestinal peptidases and decreased B12 absorption (John and Perti, 2006).

#### **1.2.4.3 *C. parvum*:**

Immunocomptent patients usually show watery diarrhoea, nausea, anorexia, vomiting and low grade of fever, accompanied by mild absorption and weight loss. Immunodeficient patient the manifestations are similar to normal immune-response individual but the diarrhoea is more severe fluid losses of up to 25L/day (Gillespie and Pearson, 2001).

#### **1.2.4.4 *B.coli*:**

Balantidial dysentary infection with *B.coli* can be asymptomatic. Balantidial dysentary occurs when ciliates invade the wall of large intestine, causing inflammation and ulceration with blood and mucus being passed in the feces. Intestinals perforation is a serious complication of balatidiasis.

(Painker, 2007).

### **1.2.5 Immunology:**

#### **1.2.5.1 *E.hisolytica*:**

Elicits both humoral and cellular immune response in humans. It is still not clear, which produce high levels of circulating antibodies and does not correlate with antibody response because trophozoite shed antibody and resist complement lyses (Ryan and Rayan, 2010).

#### **1.2.5.2 *G.lamblia*:**

Secretory IgA antibody inhibits attachment of trophozoites to intestinal epithium, perhaps by blocking parasite surface lectin. Moreover, antitrophozoites IgM or IgG antibodies, plus complement are known capable of killing *Giardia* trophozoite (Chatterjee, 2011).

#### **1.2.5.3 *C. parvum*:**

Infection causes both increase permeability of epithelium barrier and induction pro inflammatory response. Immunodeficient, where infection can be influx in number of inflammatory cell including macrophage, dendritic cell and lymphocyte Lamb, (2012). In the immune response to *C. parvum* infection, cell mediated and human immune responses are believed to be involved in the resolution of infections and the development of protection, but the specific immune mechanisms to *C. parvum* are not well understood. Cell-mediated immunity has been suggested to play an important role in clearing *Cryptosporidium* infections. CD4<sup>+</sup> T cells and interferon (IFN)- $\gamma$  activity play a major role in immune system .For example, adult athymic nude mice infected with *C. parvum*. Were reported to develop chronic infections and IFN- $\gamma$  seemed to inhibit reproduction of *C. parvum* in epithelial cell lines. These results suggest that cell mediated immune responses are necessary for both resistance to and recovery from cryptosporidiosis by *C. parvum* oocysts. Mean while, antibody responses to *C. parvum* antigens, particularly secretory IgA response to mucosal antigens, suggest that examination on the local immune response may be of interest in sero-epidemiological studies. Benhamou *et al.*, (2009) reported that *Cryptosporidium* -infected patients develop both serum and secretory antibodies to *C. parvum*. However, despite the presence of *C. parvum*-specific serum and antibodies, infection can persist with protracted diarrhea in AIDS patients. Thus, cell-

mediated immunity has shown only a limited degree of efficacy in cryptosporidiosis (Gsuri and Cheol Kim, 2006).

### **1.2.6 Diagnosis:**

#### **1.2.6.1 Parasitological diagnosis**

Macroscopical examination of faecal samples should be focused on the colour, odour, pH, presence of blood and mucus and consistency (formed, unformed or semi formed). Microscopically examination of stool, it includes saline wet mount, iodine wet mount, eosin wet mount and smear after concentration. Concentration techniques should be used for egg and cyst which are often in such low number in faecal material that they are difficult to detect in direct smears. Two methods are used sedimentation technique and floatation technique, both these methods were designed to separate intestinal protozoa and helminthic egg from excess faecal debris (Cheesbrough, 1987). In the sedimentation technique, the feces are suspended in solution with low specific gravity so that the parasitic eggs and cysts get sedimented at bottom. Centrifugation may used to see wither treatment of parasites has been successful and to see the ova or cyst if they have not been seen in routine examination (Cheesbrough, 1987). In floatation technique, the feces were suspended in solution with high specific gravity so that parasitic cysts or eggs float up and get concentrated at surface. For examples, zinc sulphate, sodium chloride and sugar solution (Chees brough, 1987). Duodenal aspirates either an entero-test capsule or duodenal drainage should be submitted. If the sample will not be examined within 2hrs, add 10% formalin. The sample may vary in volume from <0.5ml to several mls. Often the duodenal fluid may contain mucus; this is where the organisms will tend to be found. Centrifugation of the specimen is important, and the sediment mucus should be examined. If the amount of duodenal material submitted is very small, then permanent stains can be prepared rather than using any of the specimens for a wet smear examination (MSH/ TML,2004). In

culture methods, many parasites can now be grown, but this has not become routine diagnostic method. It is sometimes employed for accurate identification of parasites species. It is more often employed for obtaining large number of parasites as a source of antigen, for animal inoculation, drug sensitivity testing, for experimental or physiological studies and for teaching purposes (Painker, 2007). Immunological diagnoses have importance in diagnosing parasitic diseases, when diagnostic stage may be rare or missing, screening method in epidemiological survey. In general, immuofluorescence (If), ELISA and immuochromatographic strip test have been developed for detection of antigen in faces. Sero- diagnosis in parasitic infection has only limited value due to various factors, parasites complex antigens and exhibit wide ranging cross-reaction. It distinguish between past and current infection (Painker, 2007).

### **1.2.7 Treatment:**

#### **1.2.7.1 Treatment of *B.coli*:**

The drug of choice is tetracycline; iodoquinol and metronidazole are alternative agents(Arora and Arora, 2008).

#### **1.2.7.2 Treatment of *Cryptosporidiosis*:**

Rapid loss of fluids because of diarrhea can be managed by fluid and electrolyte replacement. Infection in healthy, immunocompetent persons is self-limited. Nitazoxanide has been approved for treatment of diarrhea caused by *Cryptosporidium* in immunocompetent patients. Immunocompromised persons and those in poor health are at highest risk for severe illness. The effectiveness of nitazoxanide in immunosuppressed persons is unclear. For persons with AIDS, anti-retroviral therapy, which improves immune status, will also reduce oocyst excretion and decrease diarrhea associated with cryptosporidiosis (Morgan *et al.*, , 2002).

### **1.2.7.3 Treatment of *E.histolytica*:**

Asymptomatic patients showing only cysts in the stool may be treated with diloxanide furoate (Furamide), where in those patients showing both cysts and trophozoites, iodoquinol or metronidazole (flagyl) may be used. The treatment for symptomatic patients varies by clinic stage of infection chloroquines plus the iodoquinol or flagyl are drug combination of choice for treatment of amoebic colitis. Patients with acute amoebic dysentery response well to dehydroemetine dihydrochloride. Flagyl or dehydroemetine plus chloroquines are suggested drug regimen for patients with amoebic liver abscess (Zeibig,1997).

**Rationale of study:**

Intestinal protozoan parasitic infections are widely spread in the world, also they are a major health problem in Sudan specially in Kosti area beside the problem in diagnosing asymptomatic infection and problem in the diagnostic techniques itself which need to improve routine technique. So this study helps to aid in solving these problem.

## **Study objectives**

### **General objective:**

To study the prevalence of intestinal protozoan parasitic infections in Kosti Teaching Hospital, White Nile State.

### **Specific objectives:**

1. To determine the prevalence of intestinal protozoan parasitic infections by using direct examination, FECT and zinc sulphate technique.
2. To determine the prevalence of intestinal protozoan parasitic infections according to gender and age groups in Kosti Teaching Hospital.
3. To identify the species of intestinal protozoan parasitic infections in wards in Kosti Teaching Hospital.

# **Chapter two**

## **Material and methods**



## **Chapter two**

### **Materials and Methods**

#### **2.1 Study design:**

It is cross-sectional descriptive study.

#### **2.2 Study area:**

This study was conducted at Kosti Teaching Hospital, in Kosti town, White Nile State.

#### **2.3 Study period:**

This study was conducted in the period between March - December 2015.

#### **2.4 Study population:**

The study was carried out on patients admitted in wards in Kosti Teaching Hospital with different ages and gender.

#### **2.5 Sample size:**

$$N = t^2 * P (1-p) / M^2$$

N = Sample size

t = the normal standard deviate (t = 1.96)

P = the frequency of occurrence of intestine parasite (1.1)

M = degree of precision (0.05%)

According to equation above the sample size was calculated as follow:

$$N = 1.96 \times 1.96 \times 1.1 \times (1 - 1.1) / 0.05 \times 0.05 = 150$$

The study was conducted on 150 clinically suspected patients.

#### **2.6 Sample collection:**

Stool specimens were collected from all participants. Stool samples were collected in wide mouth container free from water. The samples were labeled clearly with identifying number. These samples were preserved in 10% formal ether then transferred to laboratory to be examined later.

## **2.7: Methodology:**

### **2.7.1: Wet preparation:**

Stool examination consists of macroscopical and microscopical examination.

### **2.7.2 Macroscopical examination:**

The feces were examined for consistency which may be formed, semifformed and soft. The stool was examined for the present blood and mucus with certain intestinal infection (Painker, 2007).

### **2.7.3 Microscopical examination:**

The stool was prepared by mixing small amount of stool with a drop of 0.9% solutions of NaCl on a glass slide and the slide was covered with a glass cover slip and examined for the presence of parasites. The same procedure was mixed with a drop of Lugol's iodine and examined for the presence of cysts of parasites (Painker, 2007).

### **2.7.4 Zinc sulphate floatation technique:**

The technique was used as described by Cheesbrough (1987); zinc sulphate solution was added up to one quarter of tube placed in vertical position. The tube has completely smooth rim. About 0.5g of stool was added using applicator stick and emulsified in solution. The tube covered by clean cover glass, and left to stand for about 30-45 minutes so as to leave cyst and egg to float. After that, the cover glass was taken and placed in a clean slide and examined under microscope.

### **2.7.5 Formal ether concentration techniques:**

In this technique about 1gram of feces was emulsified in 4ml of 10% formal saline in screw-cap tube. Then, 3-4ml of formal saline was added, and mixed by shaking for 20 second. Feces were sieved in a beaker; suspensions were transferred to centrifuge tube. Then 3-4ml of diethyl ether was added and contents were stoppered, shaken for one minute and then was centrifuged

immediately for one minute at 300rpm. After centrifugation the parasites were sedimentated at the bottom of the tube. And fecal debris was collected in the layer between the ether and formal saline. The layer of fecal debris was lost from side of tube using stick. The tube was rapidly inverted to discard ether, fecal debris and formal saline and returned back to its upright position to allow the fluid to drain to the bottom. Sediment was mixed by pasteur pipette and transferred to clean slide, covered with cover glass and examined microscopically (Cheesbrough, 1987). Intensity of parasites was determined by using the criteria described by Cheesbrough (1998) as follows: 1-3 stages in one gram presented as scanty infection, 4-10 stages as few infection, 11-20 stages as moderate infection, 21-41 stages as many infections and over 41 stages as very many infections.

### **2.8 Data collection:**

The primary data were collected by using a questionnaire (appendix) which has specific design to obtain information that helped in the study.

### **2.9 Data analysis:**

Results obtained were analyzed by the computerized program of statistical package of social science (SPSS) version 11.5. Frequency, mean and Chi-square test were used. Then data were presented in tables.

### **2.10 Ethical consideration:**

Approval was taken from the College of Medical Laboratory Science- Sudan University of Science and Technology. Consent was taken from all participants or their guardians before being enrolled in the study. All participants were informed on the nature of the study.

## **Chapter three**

### **Results**

## Chapter three

### Results

#### 3.1 General characteristic of studied population:

The study was conducted on 150 patients who admitted in wards in Kosti teaching Hospital. All age groups were ranged 1-75years and their mean age was  $31 \pm 1.3$  years old. Out of 150 subjects, 63(42%) were males and 87 (58%) were females (table 3.1). The study subjects were divided into five age groups as follow: 1-14, 15-30, 31-45, 46-60, 61-75 years old and the frequency of each age group were 50 (32.9%), 30 (19.7%), 33 (21.7%), 24 (15.8%), 13 (8.6%) respectively (table 3.2).

**Table (3.1): Frequency of study subjects according to gender**

Gender	Frequency	Percentage (%)
Male	63	42%
Female	87	58%
Total	150	100

**Table (3.2): Frequency of study subjects according to age groups**

Age groups	Frequency	Percentage (%)
1-14	50	32.9%
15-30	30	19.7%
31-45	33	21.7%
46-60	24	15.8%
61-75	13	8.6%
Total	150	100%

### **3.2 Parasitological results:**

#### **3.2.1 Overall prevalence of intestinal protozoan infections among patients in the study area:**

Out of 150 fecal samples, 30 samples were found to be positive for intestinal protozoan infections. This constituted an overall prevalence was 20% (table 3.3).

**Table (3.3): Overall prevalence of nosocomial parasites in the study area:**

<b>Number examined</b>	<b>Number positive</b>	<b>Percentage (%)</b>
150	30	20%

#### **3.2.2 Overall prevalence of intestinal protozoan infections by using wet preparation, FECT and zinc sulphate technique in the study area:**

Out of 150 faecal samples, 11(7.0%), 26 (17%) and 10 (7.0%) were positive for intestinal protozoan infections by using direct wet preparation, FECT and zinc sulphate technique respectively (table 3.4).

**Table (3.4): Overall prevalence of intestinal protozoan infections by using direct wet preparation, FECT and zinc sulphate technique in the study area**

<b>Technique</b>	<b>Number examine</b>	<b>Number positive</b>	<b>Percentage%</b>
Wet preparation	150	11	7%
FECT	150	26	17%
Zinc sulphate	150	10	7%

#### **3.2.3 Prevalence of intestinal protozoan infections species in the study area:**

Out of 150 fecal samples, 9 (6%), 7 (5%) and 13 (9%) were positive for *G.lamblia*, *E.histolytica* and *E.coli* respectively (table 3.5).

**Table (3.5): Prevalence of intestinal protozoan infections species in the study area**

Species	Number positive	Percentage (%)
<i>G.lamblia</i>	9	6%
<i>E.histolytica</i>	7	5%
<i>E.coli</i>	13	9%
Total	30	20%

#### **3.2.4 Prevalence of intestinal protozoan infections species by using wet preparation, FECT and zinc sulphate technique:**

Out of 7 positive case of *E.histolytica* by FECT, zinc sulphate technique and wet preparation respectively were found 7 (100%), 3(42.8%) and 3(43%). Out of 9 positive case of *G.lamblia* were found (66.7%), 6(66.7%) and 6(66.7%) by FECT, zinc sulphate technique and wet preparation respectively. Out of 13 positive case of *E.coli* by FECT, zinc sulphate technique and wet preparation respectively were found 11 (85%), 4 (31%) and 3(23%) were positive for *E.coli* by FECT, zinc sulphate technique and wet preparation respectively (table 3.6). Wet preparation having significant value with *G.lamblia* ( $p=0.000$ ), *E. coli* ( $p=0.014$ ) and *E.histolytica* ( $p=0.001$ ), FECT having significant value with *G.lamblia* ( $p=0.000$ ), *E. coli* ( $p=0.000$ ) and *E.histolytica* ( $p=0.000$ ) zinc sulphate having significant value with *G.lamblia* ( $p=0.000$ ), *E. coli* ( $p=0.000$ ) and *E.histolytica* ( $p=0.000$ ) (table3.6).

**Table (3.6): Overall prevalence of intestinal protozoan infections species by using direct wet preparation, FECT and zinc sulphate techniques**

Species	Number examine	Wet prepration		FECT		Zinc sulphate	
		Number positive	Percentage	Number Positive	Percentage	Number Positive	Percentage
<i>G.lamblia</i>	9	6	66.7%	6	66.7%	6	66.7%
<i>E.histolytica</i>	7	3	43%	7	100%	3	42.8%
<i>E.coli</i>	13	3	23%	11	85%	4	31%

### **3.2.5 Detection of intensity of parasites species by using FECT and zinc sulphate:**

Out of 13 fecal samples examined by FECT as scanty, 4(30.8%), 6(46.2%) and 6(46.2%) respectively were found to be for *G.lamblia*, *E.histolytica* and *E.coli*, out of 3 fecal samples examined by zinc sulphate as scanty, 2(66.7%), 0(0%) and 2(66.7%) respectively were found to be for *G.lamblia*, *E.histolytica* and *E.coli*, out of 20 fecal samples examined by FECT as few, 3(15%), 1(5%) and 3(15%) respectively were found to be for *G.lamblia*, *E.histolytica* and *E.coli* and out of 4 fecal samples examined by zinc sulphate as few, 1(25%), 2(50%) and 1(25%) respectively were found to be for *G.lamblia*, *E.histolytica* and *E.coli* , (table 3.7) and (table3.8) respectively.



**Table (3.7): Detection of intensity of parasites species by using FECT**

Species	FECT			FECT		
	Scanty			Few		
	Number examine	Number positive	Percentage	Number examine	Number positive	Percentage
<i>G.lamblia</i>	13	4	30.8%	20	3	15%
<i>E.histolytica</i>	13	6	46.2%	20	1	5%
<i>E.coli</i>	13	6	46.2%	20	3	15%

*G.lamblia* (p=0.000), *E.histolytica* (p=0.000) and *E.coli* (p=0.000) by FECT.

**Table 3.8: Detection of intensity of parasites species by using by zinc sulphate**

Species	Zinc sulphate			Zinc sulphate		
	Scanty			Few		
	Number examine	Number positive	Percentage	Number examine	Number positive	Percentage
<i>G.lamblia</i>	3	2	66.7%	4	1	25%
<i>E.histolytica</i>	3	0	0%	4	2	50%
<i>E.coli</i>	3	2	66.7%	4	1	25%

*G.lamblia* (p=0.000), *E.histolytica* (p=0.000) and *E.coli* (p=0.000) by zinc sulphate

### **3.2.6 Prevalence of intestinal protozoan infections according to gender:**

Out of 63 males, 12 (19%) were positive for intestinal protozoan infections and from 87 females 18(20.6%) were positive for intestinal protozoan infections (table3.9).

**Table (3.9): Prevalence of intestinal protozoan infections according to gender**

Gender	Number examined	Number positive	Percentage
Male	63	12	19%
Female	87	18	20.6%
Total	150	30	20%

p=0.626

### **3.2.7 Prevalence of intestinal protozoan infections by using wet preparation, FECT, Zinc sulphate according to gender:**

Out of 63 males examined, 9(14.3%), 9(14.3%) and 4(6.3%) were found positive by FECT, zinc sulphate and wet preparation respectively and out of the 87 females examined, 17(19.5%), 4(4.6%) and 7(8%) were found positive by FECT, zinc sulphate and wet preparation respectively (table 3.10).

**Table (3.10): Prevalence of intestinal protozoan infections by using FECT, Zinc sulphate and wet preparation according to gender**

Techniques		FECT		Zinc sulphate		Wet preparation	
Gender	Number examine	Number positive	(%)	Number positive	(%)	Number positive	(%)
Male	63	9	14.3%	9	14.3%	4	6.3%
Female	87	17	19.5%	4	4.6%	7	8%

FECT (p=0.401), zinc sulphate (p=0.233) and wet preparation (p=0.694)

### **3.2.8 Prevalence of intestinal protozoan infections species using wet preparation, FECT and zinc sulphate technique according to gender (male):**

Out of 4 fecal samples examined, 3 (75%), 0(0%) and 1 (25%) respectively were positive for *G.lamblia*, *E.hitsolytica* and *E.coli* by wet preparation, out of 9 fecal samples examined, 6(66.7%), 2(22%) and 4(44.4%) respectively were positive for

*G.lamblia*, *E.hitsolytica* and *E.coli* by FECT and out of 6 fecal samples examined, 5(83.3%), 2(33.3%) and 2(33.3%) respectively were positive for *G.lamblia*, *E.hitsolytica* and *E.coli* by zinc sulphate. (table3.11).

**Table (3:11) Prevalence of intestinal protozoan infections species using wet preparation, FECT and zinc sulphate technique according to gender (male)**

Techniques	No. examine	<i>G.lamblia</i>		<i>E.hitsolytica</i>		<i>E.coli</i>	
		No. positive	(%)	No. examine	(%)	No. examine	(%)
<b>Wet preparation</b>	4	3	75%	0	0%	1	25%
<b>FECT</b>	9	6	66.7%	2	22.2%	4	44.4%
<b>Zinc sulphate</b>	6	5	83.3%	2	33.3%	2	33.3%

### **3.2.9 Prevalence of intestinal protozoan infections species using direct wet preparation, FECT and zinc sulphate technique in females:**

Out of 7 fecal samples examined, 3 (42.9%), 3(42.9%) and 2 (28.6%) respectively were positive for *G.lamblia*, *E.hitsolytica* and *E.coli* by wet preparation, out of 17 fecal samples examined, 3(17.6%), 6(35.5%) and 7(41.2%) respectively were positive for *G.lamblia*, *E.hitsolytica* and *E.coli* by FECT and out of 4 fecal samples examined, 1(25%), 1(25%) and 2(50%) respectively were positive for *G.lamblia*, *E.hitsolytica* and *E.coli* by zinc sulphate (table 3.12).

**Table (3.12): Prevalence of intestinal protozoan infections species using direct wet preparation, FECT and zinc sulphate technique in females**

Technique	Number examine	<i>G.lamblia</i>		<i>E.histolytica</i>		<i>E.coli</i>	
		Number positive	(%)	Number examine	(%)	Number examine	(%)
Wet preparation	7	3	42.9%	3	42.9%	2	28.6%
FECT	17	3	17.6%	6	35.5%	7	41.2%
Zinc sulphate	4	1	25%	1	25%	2	50%

### **3.2.10 Prevalence of intestinal protozoan infections by using direct wet preparation, FECT and zinc sulphate technique among age groups:**

Out of the 26 fecal samples examined by the FECT technique, 9(34.6%), 6(23.1%), 7(26.9%), 3(11.5%) and 1(3.8%) respectively were positive for age 1-14, 15-30, 31-45, 46-60 and 61-75, out of the 10 fecal samples examined by the zinc sulphate technique, 5(50%), 0(0%), 3(30%), 2(20%) and 0(0%) respectively were positive for age 1-14, 15-30, 31-45, 46-60 and 61-75 and out of the 11 fecal samples examined by the wet preparation technique, 2(18.2%), 2(18.2%), 5(45.5%), 1(9.1%) and 1(9.1%) respectively were positive for age 1-14, 15-30, 31-45, 46-60 and 61-75 (table 3.13).

**Table (3.13): Prevalence of intestinal protozoan infections by using direct wet preparation, FECT and zinc sulphate technique among age groups**

Techniques		Age groups(years)									
		1-14		15-30		31-45		46-60		61-75	
		No. positive	(%)	No. positive	(%)	No. positive	(%)	No. positive	(%)	No. positive	(%)
FECT	No. examine 26	9	34.6%	6	23.1%	7	26.9%	3	11.5%	1	3.8%
Zinc Sulphate	10	5	50%	0	0%	3	30%	2	20%	0	0%
Wet prepration	11	2	18.2%	2	18.2%	5	45.5%	1	9.1%	1	9.1%

FECT (p=0.782), zinc sulphate (p=0.782) and wet preparation (p=0.385)

### **3.2.11: Prevalence of intestinal protozoan infections among age groups:**

Out of 50 fecal samples examined, 10(20%) were found positive in age group 1-14, out of 30 fecal samples examined, 5(17%) were found positive in group 15-30, out of 33 fecal samples examined, 8(24.2%) were found positive in age group 15-30, out of 24 fecal samples examined, 5(20.8%) were found positive in age group 31-45 and out of 12 fecal samples examined, 2(15.4%) were found positive in age group 61-75 respectively (table 3.14).

**Table (3.14): Prevalence of intestinal protozoan infections among age groups**

Age (Years)	Number examine	Protozoa parasites	
		Number Positive	Percentage
1-14	50	10	20 %
15-30	30	5	17%
31-45	33	8	24.2%
46-60	24	5	20.8%
61-75	13	2	15.4%
Total	150	30	20%

p=0.445

## **Chapter four**

### **Discussion**

## Chapter four

### Discussion

From the results showed that the overall prevalence of intestinal protozoan infections in Kosit Teaching Hospital was (20%), however, it was higher than the rate reported by Sandokji *et al.*, (2009) in Al-Madinah Al-Munawarh Hospitals (19.8%) and lower than (11.1%) which reported by Alrifai *et al.*, (2009) in Tikrit Teaching Hospital. The difference in the prevalence is related to many factors such as hygiene practices, type of microorganisms endemic in the area and sanitation level of the hospitals.

From the investigation, it was obvious that the rate of infection in female (18(20.6%)) than in males (12(19%). This result was disagreed with Alrifai *et al.*, (2009) who found that the prevalence was higher in males (33.5%) than in females (30.8%) in Tikrit Teaching Hospital.

In this study, the highest prevalence intestinal protozoan infections 10 (20%) was reported among the 1-14years age groups and lowest rate 2(15.4%) was reported among the 61-75 age groups. This difference in rate found to be statistically insignificant at  $p=0.445$ .

The study was conducted to determine the pathogens of intestinal protozoan infections cases, for these purpose, 150 fecal samples were examined, 9 (6%) were positive for *G.lamblia* cysts, 7(5%) for *E.histolytica* and 13 (9%) for *E.coli*. The study showed that *G.lamblia* and *E.coli* were the most common cause positive parasitic infections in the study area, *E.coli* don't consider as pathogens.

The results showed that the prevalence of intestinal protozoan infections species by using FECT technique and zincsulphate floation technique, which were present scanty by using FECT technique 4(30.8%), 9(69.2%) and 6(46.2%) respectively for *G.lamblia*, *E.histolytica* and *E.coli* respectively while 3(15%), 17(85%), 3(150%) and 0(0%) were found few by using FECT technique for



*G.lamblia*, *E.histolytica* and *E.coli*. respectively. When using zinc sulphate floatation technique intensity as scanty 2(66.7%), 0(0%) and 2(66.7%) for *G.lamblia*, *E.histolytica* and *E.coli*. respectively while 1(25%), 2(50) and 1(25%) were intensity as few. The most intensity of parasites species by using FECT technique and zinc sulphate floatation technique between scanty and few infection.

## **Chapter five**

### **Conclusion and Recommendations**

## **Chapter five**

### **Conclusions and recommendations**

#### **5.1 Conclusion:**

The study concluded that the prevalence of spread intestinal protozoan parasitic infection was 20% in the study area. Females were more affected than males. The prevalence of intestinal protozoan parasitic infection was higher in age group 1-14 years than other age groups. The most common causative agents of intestinal protozoan parasitic infection in study area was *G.lamblia*.

#### **5.2 Recommendations:**

- Health authorities should exert more effort in implementing a control program which includes screening of hospitals.
- Health education.
- Committee of infection control should be build in hospitals to control infection.
- Check up the food provider, drinking water, cleaning of latrines and control the flies in hospital.

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## **Appendix**



**Appendix**  
**Questionnaire form**

Sudan University of Science and Technology  
College of Graduate Studies  
M.Sc. in Parasitology and Medical Entomology

1- ID.....

2- Sex.....

3- Age/ year (      )

4- Symptoms:

Abodmain pain (      )      vomiting (      )      fever (      )

**Labatory results:**

-Direct technique:

Positive (      )      Negative (      )

Conceration technique:

-Formal ether Conceration technique:

Positive (      )      Negative (      )

- Zinc suphate Conceration technique:

Positive (      )      Negative (      )