بسم الله الرحمن الرحيم

Sudan university of Science and Technology
College of Veterinary Medicine

A Study on Clinical Lesions of Gastrointestinal Parasites in Animals Presented to Veterinary Teaching Hospital

دراسة الآفات الإكلينكية للطفيليات الجوف معوية في الحيوانات الواردة للمستشفي البيطري التعليمي

A Dissertation submitted for partial fulfillment of the requirements of B.V.M. Honors Degree in Veterinary Medicine

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إستهلال

قَالَ اللهُ تَعَالَى:

بِسْمِ اللهِ الرَّحْمَنِ الرَّحِيمِ

" الرَّحْمَنُ (1) عَلَّمَ الْقُرْآنَ (2) خَلَقَ الْإِنْسَانَ (3) عَلَّمَهُ الْبَيَانَ (4) "

۞سُورَةُ الرَّحْمَنِ ۞

" إِقْرَأْ بِسْمِ رَبِّكَ الَّذِي خَلَقَ (1) خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ (2) إِقْرَأْ وَ رَبُّكَ الْأَكْرَمُ (3) الَّذِي عَلَّمَ بِالْقَلَمِ (4) عَلَّمَ الْإِنْسَانَ مَا لَمْ يَعْلَمْ (5) "

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صَدَقَ اللهُ الْعَظِيمُ

إِهْـــدَاءٌ

إلى.. الفؤاد الطاهر الذي ضخ نور الهداية في عروق البشرية...

الى معلم الناس الخير المشكاة التي يتم بها الهدى.. الى رسول الإنسانية .. من أرسل رحمة للعالمين..سيدنا محمد صلى الله عليه و سلم..

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الى المشعل الذي أنار لي الطريق و علمني الفضيلة و الأمانة .. الى من استعذب السير فوق الأشواك لقطف الورود.. الى القلب الذي ينبض بالعطاء دون انتظار الثناء.. الى من زرع في أعماقي الأخلاق و القيم.... أبي...

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ABSTRACT

This study was conducted in ElKadaro Veterinary Teaching Hospital January – May 2016. The objectives of the present study were to provide data on gastrointestinal parasites in different animals introduced to veterinary teaching hospital, to diagnose and describe the lesions to study the gross pathology; in order to determine the clinical and pathological lesions of these parasites. Data were collected from the records of the hospital and the laboratory and direct samples were collected and diagnosed. The total number of animals was 91 of different species. Goats were 60 (65.9%), cattle were 17 (18.7%), sheep were 7 (7.7%), horses and donkeys were 3 (3.3%), dogs were 2 (2.2%), gazelle was 1 (1.1%) and one pigeon (1.1%). Animals were presented to the veterinary hospital with different history and had mixed infection and the intestinal parasites were among their diagnosis. Most of the animals were emaciated and had diarrhea, off food, diagnosed pneumonia, external parasites and other symptoms and clinical signs. Some cases were examined in the veterinary hospital and were referred to parasitological laboratory for parasites examination and tests to confirm the diagnosis. The animals (9 goats - 3 cattle - 1 gazelle) have had history of parasitic infestation and the diagnosis were nematodes, coccidia, fasciola and tape worm. Pathological lesions were observed in case of *T. ovis* and Moniezia spp. infection. Moderate infection with *T. ovis* was characterized by catarrhal inflammation along with the petechial haemorrhages on the intestinal mucosa where parasites were firmly attached. The study clearly suggests that most of the diagnosed and reported parasites were associated with variable degrees of pathological lesions.

Keywords: gastrointestinal, parasites, lesions,

المستخلص

أجريت هذه الدراسة في مستشفى الكدرو البيطري التعليمي كلية الطب البيطري جامعة بحري و لمدة خمسة أشهر (يناير- مايو 2016). هدفت هذه الدراسة الى تقديم بيانات عن الطفيليات الجوف معوية في الحيوانات المختلفة التي أدخلت على المستشفى التعليمي البيطري لتشخيص ووصف الآفات المرضية والسريرية للطفيليات المعوية. تم جمع البيانات من سجلات المستشفى البيطري وسجلات المختبر وعينات مباشرة تم جمعها وتشخيصها. وكان العدد الكلي للحيوانات 91 من الأنواع المختلفة. وكانت الماعز 60 (65.9٪)، والماشية 17 (18.7٪)، والأغنام 7 (7.7٪)، والخيول والحمير 3 (3.3٪)، وكانت الكلاب 2 (2.2٪)، وغزال واحد (1.1٪) و حمامة واحدة (1.1٪). قدمت الحيوانات إلى المستشفى البيطري بتاريخ مرضي مختلف وتم تشخيص هذه الطفيليات. كانت معظم الحيوانات تعاني من الهزال، والإسهال والالتهاب الرئوي و تم التشخيص لبعض الطفيليات الخارجية معها وغيرها من الأعراض والعلامات السريرية. تم فحص بعض الحالات في المستشفى البيطري وأحيلت إلى مختبر الطفيليات للفحص واجراء الاختبارات للتأكد من التشخيص. تم تشخيص الديدان الخيطية، الكوكسيديا، الشريطية، والمونيزيا ضمن العينات التي اخذت مباشرة للتحليل المعملي من 1 غزال 9 ماعز و 3 ماشية. وقد لوحظت الآفات المرضية في حالات الاصابة بالدودة الشريطية و المونيزيا. وقد تميزت بالاصابة المتوسطة في الدودة الشريطية وسببت التهاب جنبا إلى جنب مع نزف دموي صغير على الغشاء المخاطي المعوي حيث كانت تعلق الطفيليات. وتشير الدراسة بوضوح أن معظم الطفيليات التي تم تشخيصها و ذكرت ارتبطت بدرجات متفاوتة من الآفات المرضية.

كلمات مفتاحية: جوف معوية، طفيليات، آفات

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INTRODUCTION

Parasitic infections are the most prevalent and important health problems of animals with losses associated with endoparasites and ectoparasites causing economic losses (McLeod, 1995). To control epidemic diseases proper animal health improvement strategic plans should be directed towards parasitic diseases as well as viral and bacterial diseases. It is also important to map the prevalence of parasitic diseases to help in determining the geographical distribution and to assess the impact of environmental factors and their effect on the epidemiology of these diseases (Gad Alkareem *et al*., 2012). The economic importance of sheep, cattle and poultry depends on the value of production and services which include meat, milk, wool and skins. Horse and donkey are steadily increasing in Sudan rather than many other African countries due to poverty. They play an important role in the provision of energy for agricultural production by way of traction of cultivation and transport of products. The production of livestock in Sudan faces many problems including infectious disease caused by bacterial disease, viral and parasitic agents. Bacterial and viral disease has almost been brought under control either by drug therapy or vaccination. Parasitic disease, however, have largely been neglected primarily because they do not often cause acute fetal disease.

General objectives of the present study are:

- To provide data on the prevalence and incidence of gastro-interstinal parasites in animals introduced to veterinary teaching hospital in Khartoum

- To describe the lesions of parasitic diseases in animals that brought to those veterinary hospitals

Specific Objective of the present study is:

To diagnose gastro-intestinal parasite lesions / diseases and study the gross pathology of them

CHAPTER ONE

LITERATURE REVIEW

Animals face many pathological conditions caused by bacteria, viruses and parasites. The pathological lesions of animals/livestock lead to decrease in production, emaciation and loss of appetite. Animal also take time to reach the peak of production after recovery (Abusara and Abdelgadir, 2014).

Veterinary Hospitals and Clinics records serve as indispensable sources of valuable information on various diseases. Veterinary hospitals and clinics may help in understanding the geographic and environmental source of diseases and their natural history (Suliman *et al.*, 2008). Khartoum State is rich with farm and pet animals. Donkeys and horses are one of the means of transportation for human and goods. Sheep and goats (household animals) are reared mainly for milk production (Suliman *et al.*, 2008).

1.2 Parasites and the ecosystems

Parasites are important for every ecosystem, and regulating mechanisms of population dynamics for species within that system (Sinclair *etal.*, 2007). The parasites are organisms that obtain their nutrients from a living host individual and are defined as Biotrophic (Begon, 2007). They can either live on (ectoparasite) or within (endoparasites) the body of the host (Hendrix and Robinson, 2006).

Parasites are usually host-specific or have evolved and developed with many of their hosts (Foreyt, 2001; Begon, 2007). Endemic parasites are parasites adapted to their hosts, and the hosts are adapted to the presence of them. They cause chronic impacts - low-level, persistent, non-lethal

debilities or diseases in contrast with nonendemic ones which cause epizootic disease, clearly harmful to the host (Sinclair, 2007).

1.2. Classification of parasites

Parasites are classified into two major groups according to their size and visibility, microparasites - parasites of microscopic size for example protozoa and macroparasites - parasites visible to the naked eye, such as nematodes, trematodes and cestodes (Lawrence, 2008). Parasites can be transmitted directly from one host to another or indirectly, requiring a vector or intermediate host (Begon, 2007).

Parasite prevalence in a host population can increase directly or indirectly, interacting with other factors such as weather condition, quantity and quality of forage or absence of large predators to name a few (Body *et al.*, 2011).

Helminthoses: is a complex of conditions caused by the nematod, cestod and trematod parasites. But as the worm numbers increase, effects in the form of reduced weight gain and decreased appetite occur. With heavier worm burdens clinical signs such as weight loss, diarrhoea, anaemia, or sub-mandibular oedema (bottle jaw) may develop (Lughano and Dominic, 1996).

1.3 Gastrointestinal parasites

The gastrointestinal tract is divided into different anatomical sections, with different species of parasites parasitizing the different sections of the tract (Body et al., 2011).

Gastrointestinal (GI) parasites are found in the host's digestive tract (stomach and intestines) and rarely cause mortality of the host (Gunn and Irvine, 2003; Irvine *et al*., 2006; Sinclair, 2007). They cause malnutrition

because of reduced appetite (Houtert and Sykes, 1996; Arneberg *et al*., 1996; Gunn and Irvine, 2003), disruption of metabolic functions (Foreyt, 2001) and food assimilation (Coop and Kyriazakis, 2001), which has negative consequences for growth, reproduction success (Foreyt, 2001; Hoberg *et al*., 2001; Albon *et al*., 2002; Stien *et al*., 2002), competitive ability and can increase susceptibility to other pathogens (Schmitz and Nudds, 1994). GI nematodes can cause parasitic gastroenteritis, with the most common clinical signs including diarrhea and weight loss or poor weight gains, bleeding, anemia, anorexia, poor pelage and among others deficiency of important microelements – calcium, magnesium, phosphorus and protein deficiency (Brglez, 1990; Coop and Kyriazakis, 2001; Hoberg *et al*., 2001; Gunn and Irvine, 2003; Taylor *et al.*, 2007).

In macroparasites, host mortality and morbidity tends to be dose-dependent (Parkins and Holmes, 1989; Houtert and Sykes, 1996; Coop and Kyriazakis, 2001; Hoberg *et al*., 2001; Wilson *et al*., 2002). Gastrointestinal nematodes cause pathological changes to the gastrointestinal mucosa, and level of damage to abomasal mucosa can be diagnosed by the increase in the concentration of serum pepsinogen (Parkins and Holmes, 1989; Gunn and Irvine, 2003). The amount of parasite burden in connection with environmental conditions, physiological and nutritional status of the host, contributes to development of either subclinical diseases or clinical disease - defined as signs, including death (Gunn and Irvine, 2003).

4. Distribution of important parasites

4.1. Sheep and Goats.

The most important sheep/goat roundworms are *Haemonchus contortus*, *Trichostrongylus* spp , *Ostertagia* (*Teladorsagia*), *Nematodirus* spp, *and Oesophagostomum* spp. Liver fluke (*Fasciola*) is also very important.

Researchers in Sudan have reported parasitic infections in sheep and goats in the Sudan (Ahmed and El Malik, 1997; Ismail *et al*., 2004) where, parasitic diseases are increasingly recognized as an important cause of reduced productivity (Almalaik *et al.,* 2008).

4.2. Cattle

Ostertagia ostertagi is the most important nematode of extensively grazed cattle. *Ostertagia* is usually found in mixed infections, including species such as *Trichostrongylus.* Liver fluke is also very important parasites affecting cattle.

In Sudan infection with internal parasites was well documented from different production system of Sudan. An investigation of diseases in dairy cattle in the White Nile and Gezira States by (Saad, 2004) revealed that *fascioliasis, paramphistomiasis* and *schistosomiasis* were the most common parasitic disases in cattle in Sudan.

Hydatidosis is a significant economic and public health problem in Sudan (Eisa *et al.,* 1977). These authors reported the disease in both the definitive and intermediate hosts in different parts of the country. The disease is not clinically manifested although it is a chronic condition where fluid-filled cysts are formed in any part of the body. Domestic intermediate hosts (cattle, sheep, goats, and camels) are major reservoir hosts for human Cystic Echinococcosis caused by *Echinococcus granulosus* in the East African region (Macpherson *et al*, 1989).

4.4. Other animals

More than 150 types of internal parasites are known to infect horses. However, from a practical standpoint, the four most significant ones are S*trongyles, Ascarids,* pinworms and bots.

Previous studies on the evidence of the occurrence of equine gastrointestinal parasites have been provided by Ismail *et al*., (2016). However, most data on donkeys were based only on analysis of veterinary records, short-period abattoirs surveys, or fecal egg count from clinical cases brought for treatment at the veterinary educational hospitals.

Donkey and other domestic animals are known to play a major role in disease transmission in Sudan in general and the study area in particular. It is worth mentioning that human. However, their data were based only on analysis of veterinary records, short-period abattoirs surveys, or fecal egg count from clinical cases brought for treatment at the veterinary educational hospitals. Some of the most important zoonotic infectious diseases are associated with parasites transmitted from companion animals to man.

The main parasitic zoonoses related to dogs and cats, with particular emphasis on their current epidemiology are Toxoplasmosis, leishmaniosis, giardiosis, echinococcosis, dirofilariosis and toxocariosis. In poultry most internal parasites are *Syitganuts trachea, Oxyspirura mansoni, Gongyhmema ingluvicola* ,Torameres spp., *Acuaria hamulosct, Dispharynx nasuta , Acuaria hamulosa, Amidostomum anserts, Capillaries spp., Heterakis spp. Ascaridia galli, Ascaridia dissimilis, Allodapa suctoria, Raillietina spp., Davainea proglottina, Hymenolepis spp., echinostoma revolutum, Amidostamimi anscris, Prosthogonimus spp.***,** *Eimeria spp.*,and *Histomonas meleagridis*.

In Sudan most cases of gastrointestinal parasites were more of a multiple infections than single endoparasites infections of different genera (Gadahi

et al., 2009). The presence of different species in sheep was recorded: *Haemonchus contortus, Oesophagostomum columbianum, Trichuris ovis, Moniezia expansa*, and Avitellina spp.. The following presence were obtained in goats: Oesophagostomum columbianum, Haemonchus contortus, *Trichuris ovis*, (Elkhawad *et al*,. 1978). In Central Kordofan and White Nile State, results indicated that infections with nematodes, cestodes as well as tremarodes are common. Nematodes were the most prevalent and they belonged to the genera *Haemonchus, Trichostrogylus, Strongyloides, Oesophagostomum, Coopria, Trichuris,* and *Skrjabinema.* Paramphistomum spp. Researchers reported the genera of nematode parasites, in rumenants. *Haemonchus contortus, Strongyloides papillosus, Oesophagostomum columbianum* and *Trichuris ovis* were the most common identified parasites in Sudan (Gagoad and Eisia, 1968; Eisia and Ibrahim, 1970; El badawi *et al*., 1978; Atta El Mannan, 1983; Ahmed and El Malik, 1997; Ghada, 2000 and Gundi, 2004).

Different reports of *Eimeria* infection of sheep and goat were documented in the Sudan. Seven species of Eimeria infection were reported, for the first time from clinical cases of sheep in Khartoum state (Osman *et al*., 1990). Abakar (1996) conducted a wide survey in various part of Sudan and reported the prevalence of eleven species in Sudanese sheep.

1.5. Parasites of the forestomachs

1.5.1 Trematodes

7.1. *Paramphistomum* spp

Paramphistomosis occurs occasionally in cattle and rarely in sheep, with significant disease mainly due to duodenitis caused by migrating immature fluke. Paramphistomes occur commonly in cattle. The adult fluke of Paramphistomes or stomach flukes are harmless although large

numbers of fluke can cause a chronic ulcerative rumenitis with atrophy of ruminal papillae.

1.6. Parasites of the abomasum

1.6.1. *Haemonchus*

Haemonchus spp are among the most pathogenic helminth species of ruminants. *Haemonchus contortus* is mainly a parasite of sheep and goats and sometimes cattle.

Clinical signs include anaemia and hypoproteinemia (manifested as submandibular oedema).

1.6.2. *Ostertagia* ('small brown stomach worm')

Ostertagia spp in small ruminants and cattle. Heavy infections (particularly if accompanied by *Trichostrongylus* spp in sheep and goats) can cause profuse scouring, ill thrift and possibly deaths. Type 1 *O. ostertagi* infections are composed almost entirely of adult worms resulting from the majority of ingested larvae developing normally to adults in 18-20 days. White, raised, umbilicated nodules (containing developing L4 worms) occur mainly in the fundic mucosa. As the larvae develop and emerge from gastric glands, hyperplasia of gastric epithelium may cause enlargement and coalescing of nodules, the mucosa classically referred to as having a 'Morocco leather appearance. Mucosal congestion and oedema is also evident, with thickening of abomasal folds. Pre-type II infections consist of large numbers of inhibited (hypobiotic) early L4s in the gastric glands with minimal tissue reaction and clinical signs apart possibly from ill thrift. Type II infections consist of adult worms arising from simultaneous maturation of many inhibited early L4s, with glandular hyperplasia, loss of gastric structure, abomasitis, impairment of

protein digestion, and leakage of plasma proteins especially albumin into the gut lumen. The mucosa appears thickened and oedematous. Outbreaks of type II ostertagiosis with diarrhoea and rapid weight loss may be seen in 18 month old beef cattle in autumn and in heifers and cows soon after calving.

1.6.3. *Trichostrongylus axei* ('stomach hair worm')

Trichostrongylus axei occurs commonly in ruminants, often in association with *Ostertagia*, and also in other host species, such as horses, but appears to be relatively non-pathogenic.

In heavy infections, aggregations of worms occur mainly in the fundus, with localized hyperaemia progressing to catarrhal inflammation with white raised circular plaques.

Gross pathology and clinical signs are those of parasitic gastroenteritis (PGE), and include inappetence, intermittent, watery diarrhoea and weight loss. Mucosal inflammation and thickening, epithelial erosions (with leakage of plasma proteins into the gut lumen) and a profuse mucous exudate may be found at necropsy.

1.7. Clinical Findings and Diagnosis

The clinical signs associated with GI parasitisms are shared by many diseases and pathological conditions. Dagnosis is based on signs, history, and season. The infection is confirmed by demonstrating nematode eggs or tapeworm segments on fecal examination. Clinical evaluation of fecal examinations depends on fecal worm egg count and specific identification of certain nematode eggs (eg, "strongyles") . Variations in the egg-producing capability of different worms (significantly lower for*Trichostrongylus*, *Ostertagia*, and *Nematodirus* than for *Haemonchus*)

may also distort the true picture. The ova of *Nematodirus*, *Bunostomum*, *Strongyloides*,and *Trichuris* are distinctive, but reliable differentiation of the more common species of ruminant *Strongyle* ova is difficult. Fecal culture of *strongyle* eggs can produce distinctive third-stage larvae if differentiation is important premortem (Mark, 2014).

To differentiate the genera and species of these parasites other clinical investigation should be done. In areas where *Ostertagia* spp predominate, the analysis of sera for increased plasma pepsinogen levels is a useful diagnostic aid. Generally, increased levels of pepsinogen activity (tyrosine levels >3 IU) are associated with clinical abomasal parasitism.. Where *Haemonchus* spp predominate, the traditional estimation of blood packed cell volume (PCV) as an indicator of anemia has been largely replaced by use of the FAMACHA test. Serologic diagnosis (ELISA) of important species, such as *Ostertagia* in cattle, is also used and based on antibody titers in bulk tank milk samples in dairy herds. . "Diagnostic drenching" may be recommended when eggs are few or absent yet history and signs suggest infections (Mark, 2014).

Routine postmortem examinations can provide valuable parasitologic data about the status of the rest of the herd or flock. On necropsy, *Haemonchus*, *Bunostomum*, *Oesophagostomum*, *Trichuris*, and *Chabertia* adults (or advanced immature worms) can be seen easily. *Ostertagia*, *Trichostrongylus*,*Cooperia*, and *Nematodirus* are difficult to see except by their movement in fluid digesta, and clinically important infections are easily overlooked. In such cases, the total contents and all washings should be combined to a known volume, and a worm count established to evaluate the severity of the infection. The number of worms found in aliquots of the gut contents and scrapings of

the mucosa will enable the total worm count to be calculated. Mixed parasite infections should be considered when evaluating clinical, laboratory, and necropsy findings, because grazing animals rarely have mono-specific infections in the field (Mark, 2014).

1.8. **Diagnosis of parasitic Diseases**

In diagnosing parasitic infections, the three pillars of veterinary diagnosis apply are history, clinical signs and gross pathology, and laboratory aids. Faecal worm egg counts (FECs) in particular (preferably with speciation by way of larval culture and differentiation), and total worm counts are the tests most commonly employed in the diagnosis of helminth infections in ruminants. FEC does not always correlate well with the number of adult worms present, particularly in cattle over 9-12 months. 'Diagnostic drenching' may be a useful tool in such cases. FECs may also be low or zero in the presence of large numbers of immature worms. Ova of the ruminant nematodes *Nematodirus*, *Bunostomum*, *Strongyloides* and *Trichuris* are distinctive, but differentiation of the more common species requires examination of third-stage larvae produced by faecal cultures. Necropsy is the most direct method to diagnose gastrointestinal (GI) parasitism. *Haemonchus,Oesophagostomum*, *Trichuris* and *Chabertia* adults can be easily seen. However, important infections with *Ostertagia*, *Trichostrongylus*, *Cooperia* and *Nematodirus* are difficult to see. These smaller nematodes can be better seen in GI tract washings, particularly against a white background, by staining for 5 minutes with strong iodine solution followed by decolourising background gut material with 5% sodium thiosulphate ('hypo'). Unfortunately the relatively high cost of total worm counts in the laboratory often precludes the use of this test,

but it is highly recommended to confirm difficult diagnoses or where anthelmintic resistance is of major concern (Smeal, 1995).

CHAPTER TWO

MATERIALS AND METHODS

2.1. Study area

The study was conducted in Khartoum State which is situated in northern Sudan between latitude 15° 38`N and longitude 32° 26`E. The total area extends over approximately 21,000 square kilometer. The climate of Khartoum is an arid type which is characterized by a wide range in daily and seasonal temperatures. During cool season between December to February, the weather is cool and dry with minimum daily temperature of 24°C. The season is characterized by low humidity. A hot dry weather prevails between March to October, a temperature of 45°C may occur during the day. The maximum rainfall is during the period from mid July to September, in this season there is an increase in relative humidity with a maximum of 68% in August. It is more convenient to divide the year into a cool dry season, hot dry season and hot wet season. Khartoum state is divided into three administration governorates: Khartoum, Omdurman and Khartoum North. Khartoum has four Veterinary hospitals Omdurman Veterinary Hospital, Khartoum Veterinary Teaching Hospital (Abu hamama), Khartoum - North Veterinary Hospital and Eastern Nile Veterinary Teaching Hospital (Al Sillait)

2.2 Study population

The study populations (91) were bovine, caprine, ovine, poultry, equine, and canine that presented in AlKadaro Veterinary Teaching Hospital (University of Bahry) and Eastern Nile Veterinary Teaching Hospital (Al Sillait, Sudan University of Science and Technology).

2.3. Equipments

The materials that were used in the laboratory: gloves, containers pestel and mortar, strainer, test tubes, slides and slide slips, pipettes, beakers, normal saline, concentrated solute Na Cl, centrifuge and microscope

2.4. Data collection

Data was collected from records and the cases presented on the routine clinical examination to animals admitted to the two Veterinary Hospitals from January 2016 to May 2016. The records include all animal information, owner name, species, case history,final diagnosis and treatment.

2.4. Parasitological examination

Faecal sampling

Using plastic gloves fresh faecal samples were collected from the rectum of animal. In a few incidences freshly defecated faeces on the ground were collected. About 20gm to 30gm were placed into a test tube containing 10% formalin and immediately labeled and closed with a rubber stopper. The polythene containers containing the fecal samples with all required information were brought to the laboratory and examined.

Faecal Examination

(a) Examination of direct smears

A small quantity of faeces was placed on a slide, mixed with a drop of water, spread out and then covered with a glass cover slip and examined directly. The smears were examined using X10 objective for parasite eggs and larvae and X40 and X100 for motile protozoa organisms (Soulsby, 1982).

(b) Concentration methods

Two qualitative procedures were alternatively used for concentration, the test tube flotation and sedimentation methods as described by MAFF (1986) were used to detect the presence of stomach and liver flukes (trematodes) and *Strongyle* eggs (nematodes) in the samples. The presence of coccidian oocysts was also recorded.

2.7. Statistical analysis

All data were analyzed by using computerized package of SPSS version 21

CHAPTER THREE
RESULTS

3.1. History of clinical cases

Many intestinal parasites lesions were diagnosed in AlKadaro Veterinary Teaching Hospital during the period from January to May 2016 (Table 1, Fig. 1). The total number diagnosed was 91 of different species. Goats were 60 (65.9%), cattle were 17 (18.7%), sheep were 7 (7.7%), horses and donkeys were 3 (3.3%), dogs were 2 (2.2%), gazelle was 1 (1.1%) and one pigeon (1.1%).

All these data were extracted from the records of the hospital.

Animals were presented to the veterinary hospital with different history and had mixed infection and the intestinal parasites were among their diagnosis (Tables 2-3-4-5-6). These Tables showed that most of the diagnosis were intestinal parasites and without refereeing to the laboratory to confirm the diagnosis.

Most of the animals were emaciated and had diarrhea, off food, diagnosed pneumonia, external parasites and other symptoms and clinical signs.

Table 7, Fig. (2) show the cases that were examined in the veterinary hospital and were referred to parasitological laboratory for parasites examination and tests to confirm the diagnosis. The animals (9 goats - 3 cattle - 1 gazelle) have had history of parasitic infestation and the diagnosis were nematodes, coccidia, fasciola and tape worm

Samples examined in the parasitology laboratory at Alkadaro Veterinary Hospital were shown in Fig. (2).

3.2. Clinical signs

All diagnosed animals presented to veterinary hospital were emaciated (Fig.3) and loss of appetite and off food ((Fig.4) and weight were obviously clear. Loss of hair (Fig.5), rough hair coat (Fig.6), rough skin (Fig. 7), nasal discharge, diarrhea and shooted diarrhea (Fig. 8) were observed as clinical signs. Some animals have had external parasites infestation

3.3. Laboratory examination

Fig. (9 - 15) show the different parasites diagnosed in animals which were *Trichuris ovis, Stronylus, Schistosoma, Moiezia, Fasciola, Coccidian, Oxyrius and Haemoncus*

Table 1: Cases of animals presented to AlKadaro Veterinary Hospital January – May 2016January

Species Months	Caprine	Bovine	Ovine	Equine	Canine	Gazelle	Pigeon	No./ Month
January	3	4	2	-	-	-	1	10
February	5	-	3	-	2	-	-	10
March	11	4	-	2	-	-	-	17
April	6	1	2	1	-	1	-	11
May	35	8	-	-	-	-	-	43
species%	60 (65.9%)	17 (18.7%)	7 (7.7%)	3 (3.3%)	2 (2.2%)	1 (1.1%)	1 (1.1%)	91

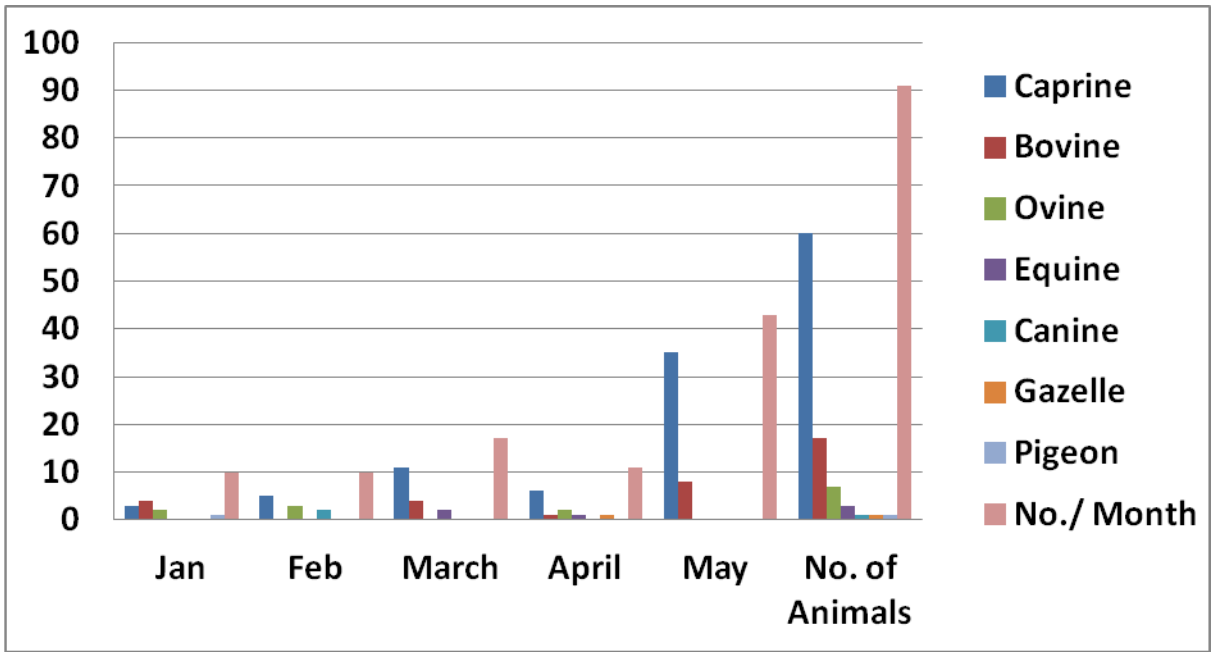

Fig. 1. Total number of animals diagnosed with intestinal parasites at Alkadaro Veterinary Hospital (January-May 2016)

Table 2: Cases of animals presented to AlKadaro Veterinary Hospital January 2016January

No.	Address	Species	History	Diagnosis
1	الحلفايا	Bovine	Emaciation	Nematode
2	ام القرى	Caprine	Weakness, Delivered for 1month with Vaginal discharge	Nematode
3	السامراب	Bovine	Abortion for2month	Internal parasite
4	السلمة	Pigeon	Nervous signs	Nematode
5	الحلفايا	Bovine	Loss of weight	Internal parasite
6	الحلفايا	Bovine	Diarrhea and emaciation	Internal parasite
7	السمرة	Caprine	Loss of appetite	Suspected of internal parasite
8	الفكى هاشم	Caprine	Off food and cough	Pneumonia and internal and external parasite
9	ام القرى	Ovine	Diarrhea	Enteritis, internal parasite and pneumonia
10	السلمة	Ovine	Diarrhea and loss of appetite	Internal parasite

Table 3: Cases of animals presented to AlKadaro Veterinary Hospital February 2016

No.	Address	Species	History	Diagnosis
1	السامراب	Caprine	Loss of appetite, Emaciation and Discharge from the eye	Internal parasite
2	الكدرو	Caprine	Emaciated and injuries in udder	Internal parasite
3	الكدرو	Caprine	Sub clinical mastitis and loss of hair	Internal parasite
4	ام القرى شمال	Caprine	Emaciation, loss of appetite and rough of hair coat	Internal parasite
5	الكباشى	Canine	Diarrhea	Internal parasite
6	ام درمان	Caprine	Loss of hair	Internal parasite
7	الحلفايا	Canine	Loss of appetite	Internal parasite
8	السمرة	Ovine	Delivered before 7days	Internal parasite
9	الكدرو	Ovine	Loss of appetite and ulcer in the mouth	Internal parasite
10	الكدرو	Ovine	Diarrhea and emaciation	Internal parasite

Table 4: Cases of animals presented to AlKadaro Veterinary Hospital March 2016

No.	Address	Species	History	Diagnosis
1	ام درمان	Equine	Anemia and cystitis	Internal parasite
2	الحلفايا	Equine	Sever emaciation	Internal parasite
3	ام القرى	Caprine	Cough and pneumonia	Internal parasite
4	الدروشاب	Caprine	Rough hair coat	Internal parasite
5	ام القرى	Caprine	Anemia, lice and diarrhea	Internal parasite and external parasite
6	السلمة	Bovine	Tick	Internal parasite and external parasite
7	الرضوان	Bovine	Diarrhea	Internal parasite
8	الكباشي	Bovine	Diarrhea	Internal parasite
9	ام القرى	Caprine	Diarrhea	Internal parasite
10	الدروشاب	Caprine	Diarrhea	Internal parasite
11	السمرة	Caprine	Loss of hair, emaciate and dystocia	Internal parasite
12	الكدرو	Caprine	Cough, nasal discharge, weakness, loss of hair and off food	Internal parasite
13	ام درمان	Caprine	Diarrhea, cough snd nasal discharge	Internal parasite
14	الفكى هاشم	Bovine	Weakness, off food and pregnant	Internal parasite
15	الكدرو	Caprine	Retain placenta	Internal parasite
16	السامراب	Caprine	Cough, fever, loss of hair, lice,diarrhea and ticks	Internal parasite and external parasite
17	ابوحليمة	Caprine	Swelling ear And Abscess	Internal parasite

Table 5: Cases of animals presented to AlKadaro Veterinary Hospital April 2016

No.	Address	Species	History	Diagnosis
1	ام القرى	Bovine	Rough hair	Internal parasite
2	ام القرى	Equine	Diarrhea and emaciation	Internal parasite
3	الكباشى	Gazelle	Diarrhea and emaciation	Internal parasite
4	الكدرو	Ovine	Recumbent	Internal parasite
5	ام القرى	Caprine	Nasal discharge, loss of appetite, emaciated and drop of milk	Internal parasite
6	السلمة	Caprine	Recumbent, dehydration and diarrhea	Internal parasite
7	الدروشاب	Caprine	Cough, emaciation and loss of appetite	Internal parasite
8	ام القرى	Caprine	Inflammation of eye, cough and nasal discharge	Internal parasite
9	الدروشاب	Caprine	Nasal discharge	Internal parasite
10	الدروشاب	Caprine	Nasal discharge	Internal parasite
11	الدروشاب(2)	Ovine	Emaciation and nasal discharge	Internal parasite

Table 6: Cases of animals presented to AlKadaro Veterinary Hospital May 2016

No.	Address	Species	History	Diagnosis
1	الحلفايا	Caprine	Diarrhea and emaciation	Internal parasite
2	الكدرو	Caprine	Diarrhea and emaciation	Internal parasite
3	الدوشاب شمال	Caprine	Abscess and loss of appetite	Internal parasite
4	الخوجلاب	Caprine	Emaciated	Internal parasite
5	ابوحليمة	Caprine	Diarrhea and emaciation	Internal parasite
6	ام القرى	Caprine	Trauma in eye and diarrhea	Internal parasite
7	السامراب	Caprine	Cough, loss of hair, temperature 40.5 ^{0} C and loss of appetite	Internal parasite
8	الكدرو	Caprine	Diarrhea and maciation	Internal parasite
9	الايزرقاب	Caprine	Diarrhea and emaciation	Internal parasite
10	الكدرو	Caprine	Cough and diarrhea	Internal parasite
11	الكدرو	Bovine	Emaciated	Internal parasite
12	السلمة	Caprine	Diarrhea and emaciation	Internal parasite
13	السلمة	Caprine	Diarrhea and emaciation	Internal parasite
14	الكدرو	6 Bovine	Diarrhea and emaciation	Internal parasite
15	الحلفايا	Caprine	Diarrhea and emaciation	Internal parasite
16	حسانية	Bovine Calve	Diarrhea and emaciation	Internal parasite

Table 7. The clinical cases examined in parasitological laboratory Alkadaro Veterinary Hospital (from records January – May 2016)

Date	Address	Species	History	Diagnosis
12\1	الرضوان	Bovine	Diarrhea	Coccidia
13\1	الخوجلاب	Gazelle	Anemia	Tape worm and coccidia
21\1	ام القرى	Caprine	Diarrhea and loss of appetite	Nematode and coccidia
21\1	ام القرى	Caprine	Diarrhea and loss of appetite	Coccidia
13\3	الدروشاب	Caprine	Weakness and diarrhea	Nematode
16\3	الحلفايا	Caprine	Weakness,cough, loss of hair and pneumonia	Nematode
20\3	ام القرى	Caprine	Off food	Nematode
20\3	شمبات	Caprine	Loss of hair	Fasciola
22\3	السلمة	Bovine	Recumbent, diarrhea and yellowish mucous membrane	Nematode
23\3	ام درمان	Caprine	Diarrhea, cough and nasal discharge	Nematode
24\3	الفكى هاشم	Bovine	Off food and diarrhea	Nematode, anaplasmosis and babesiosis
2\4	ام القري	Caprine	Weakness and loss of appetite	Nematode
3\4	أم درمان	Caprine	Nasal discharge,off food, emaciation and drop of milk	Nematode

Table 8. The samples of cases examined in parasitological laboratory Alkadaro Veterinary Hospital (from January – May 2016)

Date	Species	Diagnosis
4\1	Bovine	**Nematode**
6\1	Ovine	**Nematode**
13\1	Caprine	**Coccidian**
24\1	Caprine	**Strongyloid**
24\1	Caprine	**Coccidian**
1\2	Bovine	**Hook worm**
7\2	Caprine	**Coccidian**
11\2	Caprine	**Nematode**
12\2	Bovine	**Nematode**
12\2	Bovine	**Nematode**
28\2	Caprine	**Nematode**
1\3	Caprine	**Nematode**
5\3	Caprine	**Strongylus**
6\3	Bovine	**Nematode**
14\3	Ovine	**Fasciola**
14\3	Bovine	**Coccidian**
15\3	Bovine	**Nematode**
17\3	Bovine	**Coccidian**
21\3	Ovine	**Nematode**
22\3	Bovine	**Nematode**
24\3	Caprine	**Nematode**
30\3	Bovine	**Nematode**
3\4	Equine	**Strongyloid**
3\4	Caprine	**Nematode**
6\4	Bovine	**Nematode**
9\4	Bovine	**Nematode**
16\4	Caprine	**Nematode**
24\4	Caprine	**Nematode**
28\4	Caprine	**Nematode**
28\4	Caprine	**Nematode**
28\4	Calve	**Nematode**
2\5	Bovine	**Nematode**
5\5	Bovine	**Nematode**
10\5	Bovine	**Nematode**

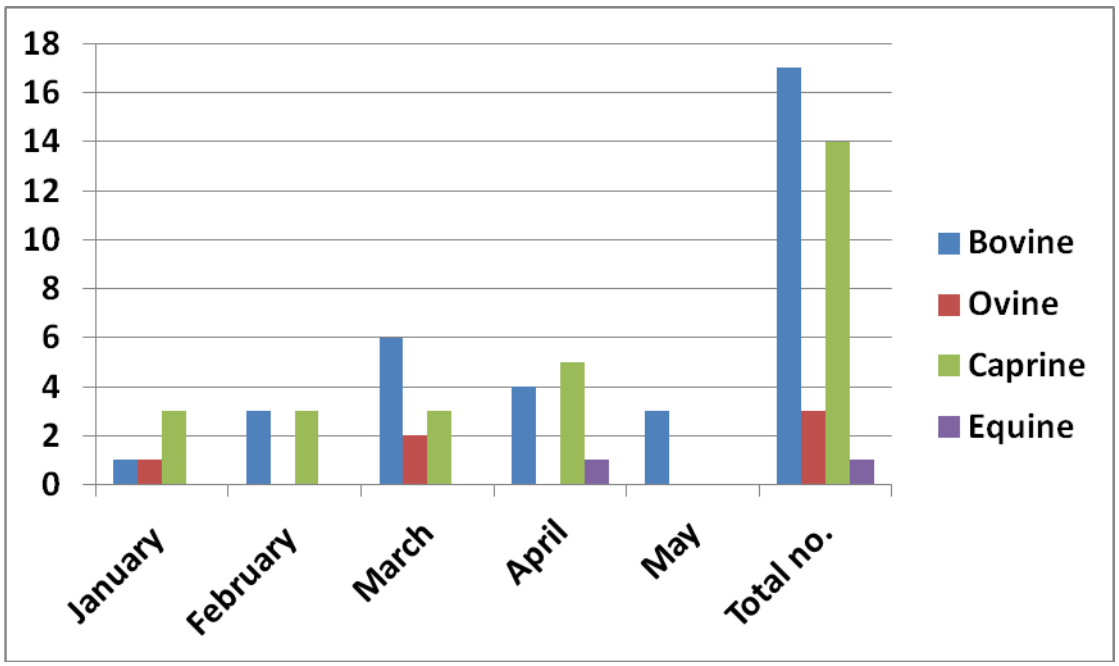

Fig. 2. Sample examined in the parasitology laboratory: Alkadaro Veterinary Hospital (from January – May 2016)

Fig. (3) Emaciated cow presented to AlKadaro Veterinary Teaching Hospital

Fig. 4. Off food and emaciated cow presented to AlKadaro Veterinary Teaching Hospital

a) b)

Fig. (5). Loss of hair (a) and rough coat (b) of cow infected with parasitic infestation presented to AlKadaro Veterinary Teaching Hospital

Fig. (6). Rough skin of cow infected with internal parasites presented to AlKadaro Veterinary Teaching Hospital

Fig. 7. Emaciated cow with diarrhea presented to AlKadaro Veterinary Teaching Hospital

Fig. 8. *Trichuris ovis* (40X)

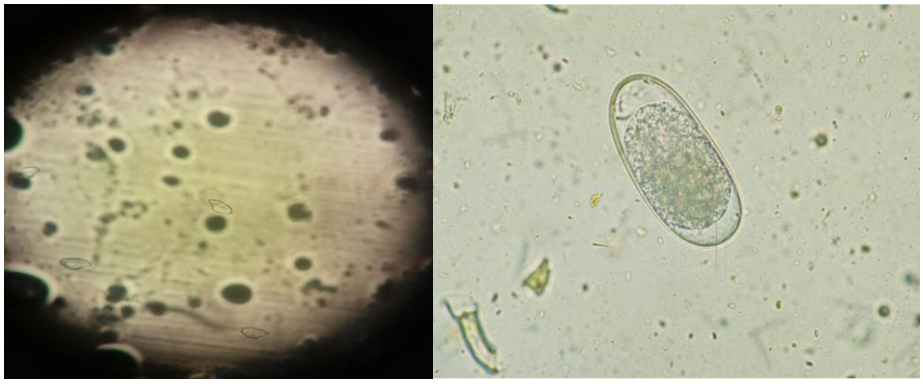

Fig. 9.*Strongylus* (40X, 100X)

(Fig 8 and 9 showed types of nematode ova in different animals presented to AlKadaro Veterinary Teaching Hospital)

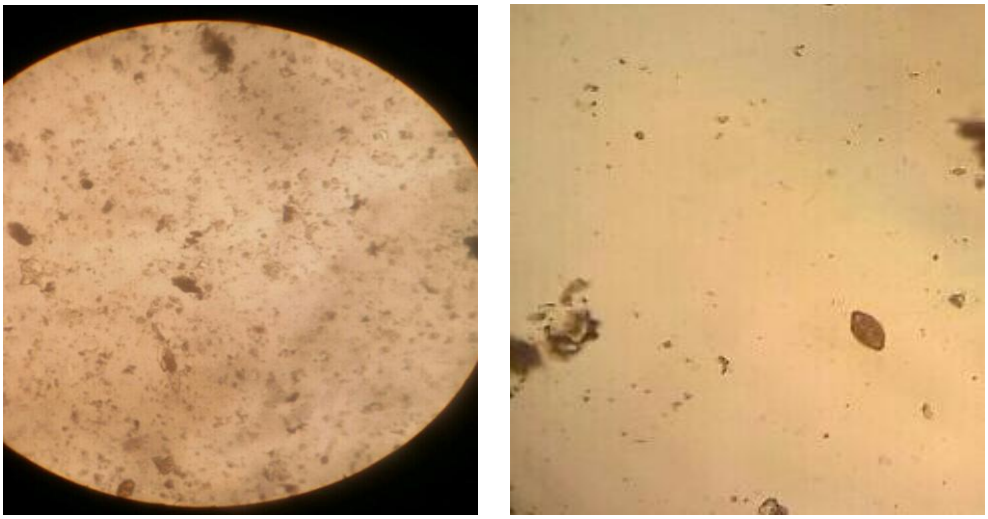

Fig. 10.*Scistosoma bovis* (40X)

Fig. 11.*Moniezia* sp. (100X)

(Type of tape worm ova examined presented to AlKadaro Veterinary Teaching Hospital)

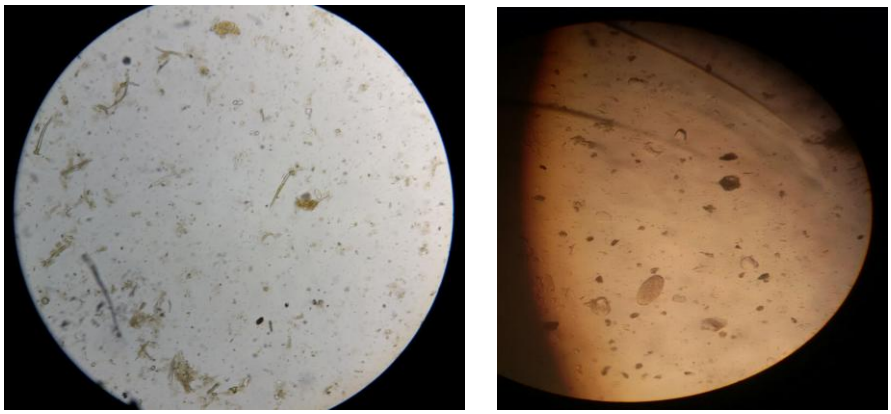

Fig. 12.*Fasciola* sp. (40X)

Fig 10 and 12 showed types of trematode ova examined at presented to AlKadaro Veterinary Teaching Hospital

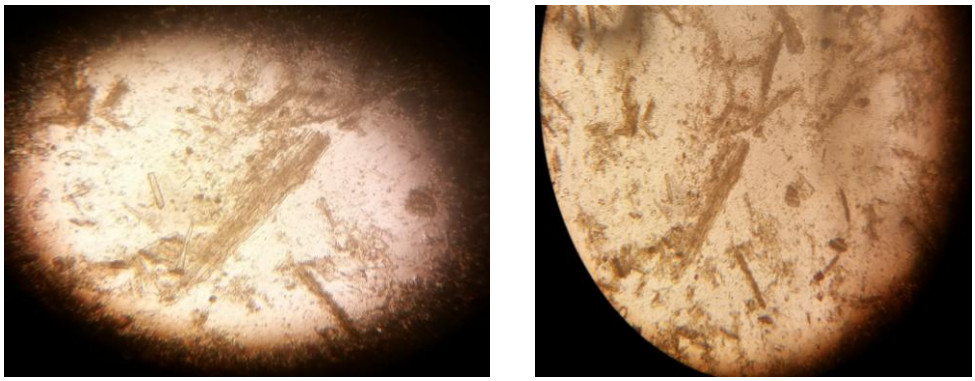

Fig. 13. *Coccidia* sp. (40X)

(Types of protozoa cysts presented to AlKadaro Veterinary Teaching Hospital)

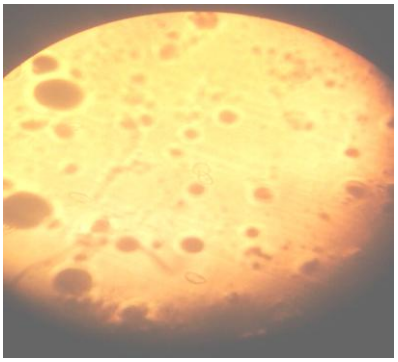

Fig 14. *Oxyrius* sp. (40X).

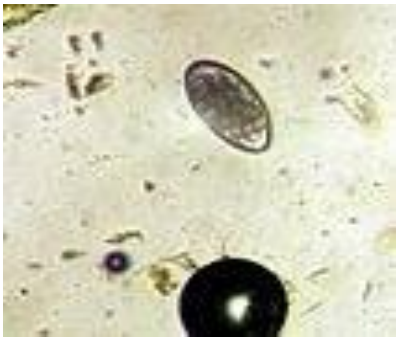

Fig 15. *Haemonchus* sp. (100X)

CHAPTER FOUR

DISCUSSION

Gastrointestinal parasites are among the major causes of severe losses to livestock. The results presented in this research reveal the prevalence of various gastrointestinal parasites in animals presented to Veterinary Hospitals. Goats have high incidence of internal parasites than other animals. This is because goats are kept in urban and peri-urban Khartoum City. The prevalence of *Strongyle* parasites was higher in goats may be because they roam and feed at the city garbage dumps where they are concentrated is smaller spaces and hence come into contact with more infective nematode larval stages. On the other hand, goats feed from the upper parts of shrubs and trees where there are fewer chances of encountering infective nematode larvae. These results agreed with the study done in Tanzaia (Mhoma *et al.,* 2011). Some species of *Strongyles* such as *Haemonchus* spp have been reported to cause serious pathogenic effects including gastroenteritis poor growth rates and even heavy mortalities (Kagira and Kanyari, 2001).

Some genera of coccidia such *Eimeria* have species that are pathogenic causing diarrhoea, abdominal pain, anaemia, inappetance, weakness and loss of weight in goats and sheep (Soulsby, 1982; Kanyari, 1988). From the study it was evident that goats are has high prevalence of gastrointestinal helminthes. Similar experiments were conducted by earlier scientists in different breeds of goats in various countries**.** Hassan (1964) reported that 82.1% goats were positive for helminth infections whereas Patel *et al*., (2001) recorded 54.92% gastrointestinal helminth infection in goats in India. *Fasciola gigantic* infestation was lower than other parasites during this period. These results disagreed with the

research done by (Mhoma *et al*., 2011). However, the observed lower infection can be due to absence of poor water drainage and wetlands the habitats for the reproduction of the water snails, the intermediate hosts for the trematodes. Fasciolosis in small ruminants and cattle causes great economic losses through condemnation of livers at slaughter (Mellau *et al*., 2010). Few infections with *Trichostrongylus* sp. was reported in sheep and goats and this similar to research done in Western Sudan (Ahmed and El Malik, 1997). Furthermore, the study revealed that *Strongyloides papillosus* was recorded in goats. In the present study, *T. ovis* infected goats with high rate than in sheep. This is in agreement with the earlier findings by Dunn (1978). In the present study, the lowest parasites infection observed indicated clearly the environment of the dry season unfavourableness for the development and survival of the extra host stages of the GIT parasites. This observation is close to that found by Ismail *et al*., (2004) and Sissay (2007). Thus, the infection of GIT parasites observed in the study area during the dry season is due to accumulation of the GIT parasite infections from the previous autumn. In the present study, all parasitic clinical signs of infection were observed such as emaciation, weakness, loss of appetite. Therefore, significant economical losses in production are expected to occur in the study area.

Donkey presented to Veterinary Hospital were few and were diagnosed with nematodes infection this results were similar to a field survey in donkeys from Khartoum State that were examined parasitically for the presence of helminthes parasites. Six nematode genera were encountered in donkeys, among them *Dictyocaulus arnfieldi,* Strongylus sp., *Cyathosyomes, Parascaris equorum, Trichostrongylus axei* and *Strongyloide westeri* (Seri *et al.,* 2004).

CONCLUSION AND RECOMMENDATIONS

Conclusion

The results of this study showed that cattle, goats and sheep are commonly infested with a variety of gastro intestinal parasite species. The highest numbers of animals presented to veterinary clinic are goats with prevalence rate of infection of 65.9%.

It could be concluded that goats and cattle have high incidence of parasites than sheep and other animals because they are kept under traditional methods of husbandry with additional stress such as malnutrition and poor management system.

This study also revealed that trematodes are the most common parasites of the research farm ruminant, and are reported as the most incriminated gastro- intestinal parasites of domestic ruminants.

Recommendation

- The results of the research suggest that there high rate of gastro intestinal parasitic infection among animals presented to Veterinary Hospitals; therefore, the use of chemotherapy like mebendazole is highly recommended in the treatment of gastro intestinal parasitic infection.
- Animals should be dewormed at regular interval with an appropriate anthelmintic.
- More researches should be conducted to ascertain effective ways of reducing gastro-intestinal parasitic burden among ruminants specially as the resultant effect of this may lead to great loss and decreases productivity of these ruminants.

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Appendix

Fecal sample taking