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Heamatological Changes Associated with Gastrointestinal Parasites Infection in Domestic Animals attended to Outpatient Clinic of Faculty of Veterinary Medicine of Diyala University, Iraq

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ABSTRACT: *Background and aim:* This study conducted to determine gastrointestinal parasite (GI) infection and evaluation of some heamatological changes in domestic animals .
Methods: One hundred fecal samples and blood were collected (4 camels; 4 horse; 5donkey; 40 cattle; 26 sheep, 18 goats and 3 dogs).
Results: Of the total samples examined,86 (86.0%) were found positive for GI parasites. The hematological changes recorded in sheep, goat and cattle infected by GI parasites show decrease in PCV, Hb, RBCs and Plasma protein while slight increase in WBCs. Prevalence of GI parasite infection was higher (96.15%) in sheep compared with cattle (85.0%) and goats (83.33%). High percentage of infection (100 % / 60%) in horse than donkey was recorded respectively.
Significant difference ($P<0.05$) was recorded in prevalence of GI parasites among small age group when compared to adults in sheep goats and cattle. Parasites identified in this study includes protozoan Eimeria spp. (95.40%), Nematodes, as Strongyles type of eggs (86.20%), *Strongyloides papillosus* (47.12%), Parascaris eqiurum (4.59%) and *Oxyrius equi* (25.0%) . Cestodes (50.57%), as Monieza sp. (48.27%), *Monieza expansa* (52.38%) *Monieza benedeni* (47.61%) and Anaplocephalum sp.(2.29%). The percentage of *Monieza expansa* and Monieza benedeni in sheep was (55.0%), (45.0%) respectively and in Goat (66.66%), (33.33%) while in Cattle (30.0%), (70.0%) respectively. Mixed infection was detected in 73 (84.88%) while single infection was detected in 13 (15.11%) in domestic animals samples.
Conclusion: Mixed infections and young age come in consideration as a cause of hematological changes in farm animals.

KEYWORDS: Hematological changes, GI parasites, domestic animal.

1 INTRODUCTION

Parasitic diseases are the major obstacle in the growth and development of animal health all over the world (Saeed et al., 2010; Mahfooz et al., 2008). Gastro-intestinal (GI) parasitic infections are characteristic of pastoral grazing systems and many GI parasitic species have developed resistance to anthelmintic drugs (Waller, 1994; Min et al., 2005). The productivity of animals is constrained due to GI parasitic infections that can have extensive consequences, ranging from reduced animal performances to mortality (Sykes, 1994; Waller, 1999). Subclinical GI parasitic infections occasionally depress feed intake and animal productivity, impair tissue deposition and lower growth rate (Sykes, 1994). GI parasite in sheep and goat is a substantial problem plaguing farmers across the nation. As gastrointestinal parasite infection is the most important limiting

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factor of sheep and goat productivity, parasitism has a highly detrimental effect on the sheep than goat industry (Jones, 2001).Horses, among most domestic animals are reported to be more susceptible to a large number of parasites and may harbor different species at any time (Wannas, et al., 2012). An apparently healthy horse can harbor over one – half million GI parasites such as protozoa, trematodes, cestodes and nematodes (Martins et al., 2009; Stoltenow and Purdy, 2003). Donkeys act as a means of transport of goods. Donkeys do suffer from a major clinical illness. Parasitic infestation is a major cause of illness (Egan et al., 2010). Camel is known to tolerate a lot of parasitic infections of economic importance among many animals with minimal economic losses (Jackson ,.1987) but it is also known to infected with various helminth parasites which can cause diarrhea and other clinical signs and lead to a decrease in productivity of camels (Tembely, et al,. 1992). German shepherd dogs have been used for police work like tracking criminals, detecting and holding of suspects, detection of narcotics and explosives. They achieve this work by their keen sense of smell (Shadia,2009).

2 MATERIALS AND METHODS

2.1 AREA OF THE STUDY

The study conducted in outpatient clinic -College of Veterinary Medicine, University of Diyala-Iraq

2.2 ANIMALS

Total of (100) animals from different species, age, sex and breed were examined clinically. As in shown in table (I).

2.3 CLINICAL EXAMINATION

Animals are examined clinically for general body condition, signs of diarrhea, auscultation of respiratory and heart rate, mucus membrane and body temperature.

2.4 FECAL SAMPLES COLLECTION

The sample collected from the animal by two methods :

Directed from the rectum

- In large animals (cattle, camel and horse) by Introduce the hand into the anus using gloves and lubricant.
- In small animals (sheep , goat and dog) by one –two fingers are inserted inside the rectum using gloves and lubricant.

From the ground

When the animal is observed defecating.

The sample was put separately into plastic container with a lid and data pertaining to the sex, age and consistency of faeces were recorded.

2.5 HAEMATOLOGY

Animals infected by sever gastrointestinal parasite only were collected blood sample from Jugular vein to estimation of blood parameter. The blood was collected into vials containing sodium ethylenediamine tetracetic acid (Na2 EDTA) sufficient for 5 mL of blood to prevent coagulation. The tubes were gently rotated to ensure proper mixing of the blood with the anticoagulant without damaging the integrity of the cells and were transported to the laboratory.

a-Red cell indices packed cell volume (PCV)

The blood collected in special anticoagulant bottles were used to determine the PCV of each sample using micro-capillary tubes, which were filled by capillary action and centrifuged at 3000 rpm for 5 minutes after sealing the end of the tube. After the centrifugation the PCV in percentage was read in a special haematocrit reader and the results were recorded.

b-Red blood cell count (RBC)

Blood was drawn in to a special red cell pipette, which gave a dilution of 1 to 200 when the blood was drawn to the 0.5 mark and diluted to form the 101 mark. After been drawn and well mixed the dilution discharged onto hematocytometer counting chamber and allowed to settle for few minutes. The high dry objective of the microscope was used to evaluate the

total erythrocyte count. The total number of cells in five squares in the center of the counting chamber was determined and multiplied by 10,000.This value represented the total number of erythrocytes per cm3 of blood.

c- Haemoglobin concentration (Hb)

0.1 Normal hydrochloric acid added to whole blood using the acid hematin method, which depends on conversion of haemoglobin to acid hematin. Color of the blood in a test tube after addition of the 0.1 normal HCL observed with serial dilution with HCL until color matched a standard. The reading was reported in g/100 mL.

d-White Blood cell indices (WBC)

The hemocytometer method used. The dilution factor was 1:100 and the total leucocytes were determined by counting all of the cells in the entire ruled area of a hemocytometer. The total count was calculated using the following formula:

Total leucocytes in 4 squares mm × 50 = Leucocytes/ CU.mm.

2.6 DIAGNOSIS OF PARASITES

After samples collected from animals, the gastrointestinal parasites are diagnostic by.

A- Macroscopic examination of fecal sample

Fecal samples were subjected to general appearance as consistency of feces (formed, soft or watery), colour, odour (Soulsby 1986).

B- Microscopic examination of fecal sample

After collecting the samples a direct smear was first made using tap water, coverslip applied, and it was examined under the light microscope at × 40.

a) Floatation Technique

This technique is used easily for the identification of eggs of nematodes and cestodes. Briefly, faeces were comminuted in saturated salt solution, faecal debris were discarded. The fluid was poured into a straight-sided tube until a convex meniscus appeared at the top of the tube and a coverslip was applied immediately. The preparation was allowed to stand on level surface for fifteen minutes, the coverslip was removed and applied to the glass slide and examined (Soulsby, 1978).

b) Sedimentation Technique

This technique is good for trematodes eggs because they are heavier and so sediment down to the bottom of the container. The supernatant from the floatation technique was poured off and a small quantity of the sediment collected with a pipette/dropper and it was put on a glass microscope slide, coverslip was applied and examined (Soulsby, 1978).

c) Quantitative method as McMaster technique

used to counting eggs of parasites per gram of feces (EPG), according to techniques and morphological characteristics suggested by (Soulsby, 1978 , Zajac and Conboy 2006).

C- Detection of the larvae of GI parasites by Baerman technique

This test used to detection larva of lungworm species causing parasitic bronchitis or verminous pneumonia in sheep, cattle, horse.

Identification of parasite

The parasites were identified by using low and high power of microscope according to the keys and morphological characteristics (Soulsby, .1986).

3 RESULT

Clinically sever infected animal by Strongyles type of egg was passing from paleness of conjunctiva, loss of appetite, dehydration, anemia, emaciation, increase in respiratory and heart rate in some sheep, goat and she camel. Whenever, rough wool coat, weight loss ,pasty feces to yellowish diarrhea and dysentery in small age group (1 –<12 Month) of some sheep and goat infected by coccidiosis. Whenever, Coccidiosis in some cattle and camel exhibited by mucus with diarrhea. One horse infected by Oxyrius equi was suffered itching of perineum region and loss hair of tail.

The overall prevalence of GI parasites recorded in domestic animals examined was 86 (86.0%). Mixed infections represents 73 (84.88%) than single infection 13 (15.11%) in domestic animals.

The present study recorded three type of GI parasite infection as well as, protozoan (95.34%)Eimeria spp., Nematodes, as Strongyles type of eggs (87.20%), Strongyloides papillosus(46.51%),Parascaris eqiurum (4.65%) and Oxyrius equi (2.32%). Cestodes (50.0%),as Monieza sp. (47.67%), *Monieza expansa (*52.38%) Monieza benedeni (47.61%) and Anaplocephalum sp.(2.29%). The percentage of *Monieza expansa* and Monieza benedeni in sheep was (55.0%), (45.0%) and in Goat (66.66%), (33.33%) while in Cattle (30.0%) ,(70.0%) respectively, as in Fig.(1,2,3,4).

Six Eimeria species were identified; *E.ahsat* (28.0%), *E. crandallis* (24.0%), *E.granulosa* (20.0%) , *E.parva* (16.0%), *E. intricata* (12.0%), *E.pallida* (8.0%) in sheep and in goats are *E.ahsat* (33.33%) , *E. crandallis* (26.66%) , *E. intricate* (20.0%) and *E. parva* (13.33%).

The present study shows significant difference (P< 0.05) between sex of animals and breed of animals with percentage of GI parasite infection as in table (2). On the other hand there are difference between species of animals and percentage of infection as in table (2). The study shows high percentage of infection in small age group more than large age group as in table (3). Species of Eimeria which were diagnosed in this study was described and identified according to (Coles , 1986 and O'Callaghan et al. 1987). The interpretation result of McMaster counting for egg of nematode (Strongyles type of egg) in sheep and goat was a ranged from mild infection 800 EPG to severe infection 2600 EPG in small and adult age group, but in cattle was a mild infection about 600 EPG and severe infection 3200 EPG. Whenever mild infection (380 EPG) was recorded in horse and donkey. On the other hand, the severe infection by (Isospora rivolta.) was recorded in puppy of German shepherd dog. Baerman technique was used to detection larva of GI parasite infection in animals of study show negative result. Erythrogram and leukogram : Decrease in erythrocyte count ,hematocrit, hemoglobin and slight increase in WBC recorded in some animals infected by GI parasites in severe cases of infection as in Table (4).

Table 1: Number of animals examined according to species, sex and breed.

Species	Total number	Sex Male / Female	Breed
Sheep	26	16 / 10	(16) Local + (10)Gross
Goat	18	7 / 11	(10) Local + (8) Gross
Cattle	40	14 / 26	(22) Local + (18)Friesian
Camel	4	1 / 3	(4) Dromedary
Horse	4	3 / 1	(4) Local
Donkey	5	3 / 2	(5) Local
Dog	3	3 / 0	(3)German shepherd
Total	100	45/ 55	

Table 2: Identification Species of gastrointestinal parasite in farm animals

GI parasite species (%)	N.S - P.N (%)	*Emeria sp.*	*Strongyloid papillosis*	*Monezia Sp.*	*Strongyle type of egg*	*Parascaris equrum*	*Anaplocephalus sp.*	*Oxyrius equi*
Goat	18 - 15 (83.33)	15 (100.0)	10 (66.66)	11 (73.33)	13 (86.66)	0 (0.0)	0 (0.0)	0 (0.0)
Sheep	26 - 25 (96.15)	25 (100.0)	18 (10.0)	20 (80.0)	23 (92.0)	0 (0.0)	0 (0.0)	0 (0.0)
Cattle	40 - 34 (85.0)	30 (88.23)	12 (35.29)	10 (29.41)	34 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
Horse	4 - 4 (100.0)	4 (100.0	0 (0.0)	0 (0.0)	2 (50.0)	2 (50.0)	2 (50.0)	1 (25.0)
Donkey	5 - 3 (60.0)	3 (100.0)	0 (0.0)	0 (0.0)	1 (33.33)	2 (66.66)	0 (0.0)	1 (33.33)
Camel	4 - 4 (100.0)	4 (100.0)	0 (0.0)	0 (0.0)	2 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)
Dog	3 - 1 (33.33)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Total	100- 86 (86.0)	82 (95.34)	40 (46.51)	41 (47.67)	75 (87.20)	4 (4.65)	2 (2.32)	2 (2.32)

Table 3: Relation between sex and breed of animals with percentage of infection

Species	Total number of samples /positive samples	Sex						Breed					
		Male			Female			Local			Cross		
		No.	positive	Negative	No.	Positive	Negative	No.	positive	Negative	No.	positive	negative
Goat	18 - 15 (88.88%)	7	6 (85.71%)	1 (14.28%)	11	9 (90.9%)	2 (9.09%)	10	8 (80%)	2 (20%)	8	7 (87.5%)	1 (12.5)
Sheep	26 - 25 (96.15%)	16	16 (100%)	0 (0%)	10	9 (90%)	1 (10%)	16	15 (93.75%)	1 (6.25%)	10	10 (100%)	0 (0%)
Cattle	40 - 34 (85%)	14	12(85.71%)	2 (14.28%)	26	22 (84.61%)	4 (15.38%)	22	21 (95.45%)	1 (4.54%)	18	13 (72.22%)	5 (27.77%)
Horse	4 - 4 (100%)	3	3 (100%)	0 (0%)	1	1 (100%)	0 (0%)	4	4 (100%)	0 (0%)	0	0 (0%)	0 (0%)
Donkey	5 - 3 (60%)	3	2 (66.66%)	1 (33.33%)	2	1 (50%)	1 (50%)	5	3 (60%)	2 (40.0)	0	0 (0%)	0 (0%)
Camel	4 - 4 (100%)	1	1 (100.0)	0 (0%)	3	3 (100%)	0 (0%)	4	4 (100%)	0 (0%)	0	0 (0%)	0 (0%)
Dog	3 - 1 (33.33%)	3	1 (33.33%)	2 (66.66%)	0	0 (0%)	0 (0%)	0	0 (0.0%)	0 (0%)	3	1 (33.33%)	2 (66.66%)
Total	100 – 86 (86%)	45	41 (91.11%)	6 (14.63%)	55	45 (81.81%)	8 (17.77%)	61	55 (90.16%)	6 (9.83%)	39	31 (79.48%)	8 (20.51%)
X^2	X^2= 14.182				X^2= 464.75			X^2= 464.75			(P < 0.05) , S.D		

Table 4: Relation of age of domestic animals with percentage of infection

Species of animals	Age	Number of animals	Positive Number	Percentage of infection (%)
Sheep and goat	1 – <12 Month	23	22	(95.65)
	1 Year - 4years	21	18	(90.47)
Cattle	2- < 12Month	16	14	(87.5)
	1 Year – 6 Years	24	20	(83.33)
Horse and donkey	2 Month	2	2	(100.0)
	4-7 Years	7	5	(71.42)
Camel	2-4 Years	4	4	(100.0)
Dog	2-3 Month	1	1	(100.0)
	3-5 Years	2	0	(0.0)
Total		100	86	(86.0)
X2= 16.612 P<0.05 SD				

X^2= Chi-Square, P= Probability value (P< 0.05), S.D = Significant difference

Table 5: Heamatological changes and normal values of some animal study.

Test	N.V* ------- I.N Mean ± Std. D sheep	N.V* ----- I.N Mean ± Std. D Goat	N.V* --------- I.N Mean ± Std. D Cattle	N.V** ------ I.N (Puppy)
Hematocrit (Hct) (%)	27-45 -- 26.81 ± 2.9	22-38 -- 21± 1.7	24 - 46 --- 34.81±1.40	35-52-----22
Hemoglobin (Hb) (g/dL)	9-15 -- 7.8 ± 0.4	8 -12--- 6.4	8-15 ---- 10.93±1.03	12-18-----6.6
RBCs (per/µL)	9-15x106--5675000± 62.38	8-18x106.—5825000± 63.23	5-10x106------74500000± 671104	5.5-8.5x106-3666450
MCV (fL)	28-40 --- 44 ± 6.23	16 -25 ----30.76± 7.55	40-60 -----50.09± 4.08	60-77---- 60
MCH (pg)	8-12---- 13.12 ± 1.4	5.2-8 ----10.98±0.255	11-17 --- 15.85±0.26	20-25----18
MCHC (g/L)	30-36 --- 28.9 ± 1.8	31-34 --- 30.47±4.55	30-36 --- 32.32±2.67	32-36---- 30
Total plasma protein (TPP) (g/dL)	6-7.9 ---- 5.8 ± 0.178	6-7.9 ----- 5.6± 0.109	5.7-8.1 ---6.4 ± 0.209	5.1- 7----- 4.8
Thrombocytes (per/µL)	(100-800)x103 ---8120450	(250-750)x103--785245	(300-600) x103-- 6255120	2-9 x105 ---20850000
WBCs (per/µL)	(4-12)x103 --- 12240± 6.121 ↑	(4-13)x103-- 8550±711.1	(4-12)x103---8537.4±519.1	6-17x103----- 6850
Band Neutrophils (per/µL)	0--- 122.4± 0.632	0--- 171± 0.638	0-120 ---170.47±	0-300 --- 137
Segmented Neutrophils (per/µL)	700- 6000 --- 4161.6± 0.894	1200–7200--3249±1.788	600- 4000-- 2988.09± 3.76	3000-11500---3082.5
Eosinophils (per/µL)	0-1000 --- 1836± 1.505 ↑	0 –650 --- 1111.5±1.643 ↑	0-2400---- 1109.86± 1.5	100-1000 ---- 753.5
Basophils (per/µL)	0-300---- 122.4± 0.516	0-120 ---- 85.5± 0.516	0—85.73± 0.510	0-100 ---- 68.5
Monocytes (per/µL)	0—750 ---- 1591.5± 0.684 ↑	0—550--- 940.5± 0.694 ↑	25-800---1024.44±1.1	200-1400---890.5 ↓
Lymphocytes (per/µL)	2000–9000-- 4406.4 ± 0.894	2000-9000---2992.5±1.788	2500-7500-- 3158.69±4.58	2500-17500----1918↑

N.V= Normal value according to Radostits , et al.2007 and NV** Hoffmann, 2010).*

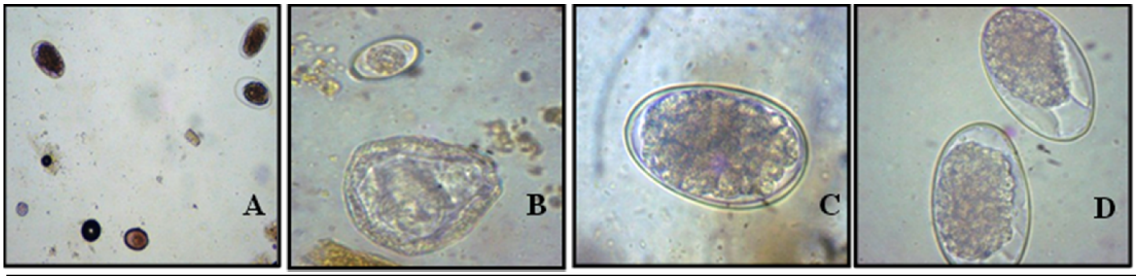

Fig [1].(A) Egg and Oocyst of GI parasite Mixed infection,(Flotation, 20 X) (B) Oocyst of *Eimeria sp* and *Moniezia benedeni* in cattle. (C) Strongyles type of eggs in cattle. (D).Strongyles type of eggs in equine (Flotation, 40X).

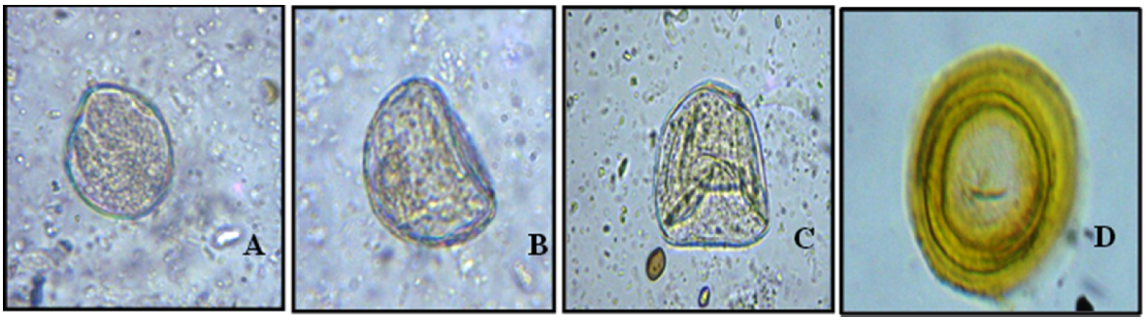

Fig .[2] (A),Egg with larva of *Strongyloides sp.* in horse,(B). Egg of *Oxyuris equi* ,(C). Egg of *Anoplocephalan* sp. , (D). Egg of *Parascaris equorum* in horse.(Flotation ,40X).

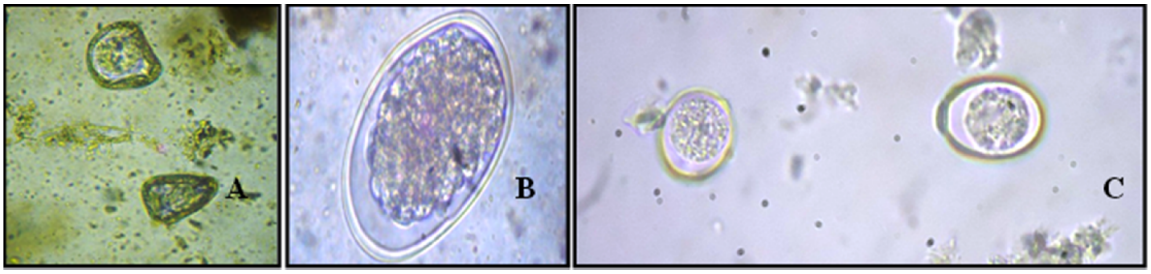

Fig .[3] (A). Egg of *Moniezia benedeni* (upper) and *Moniezia expansa* (lower), (Flotation 20X) (B). Strongyles type of eggs in sheep.(C). Oocyst of *Eiemeria granulosa* (right) and *Eiemeria ovioniondalis* (Left) in sheep. (Flotation, 40X)

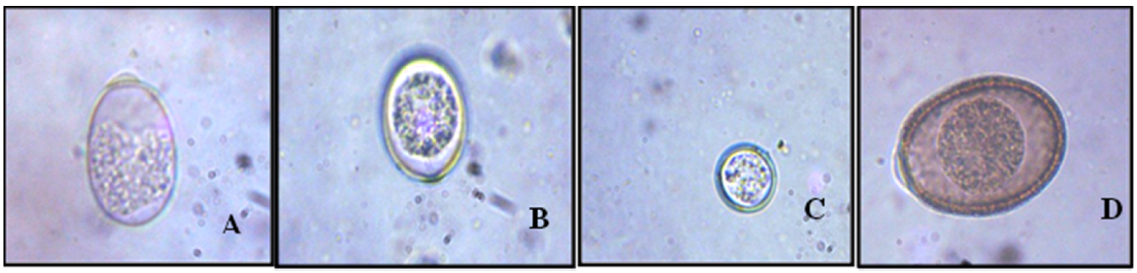

Fig.[4] (A) Oocyst of *Eiemeria ahsata* ,(B) *Eiemeria pallida* ,(C). *Eiemeria parva*,(D) *Eimeria intritica* in sheep

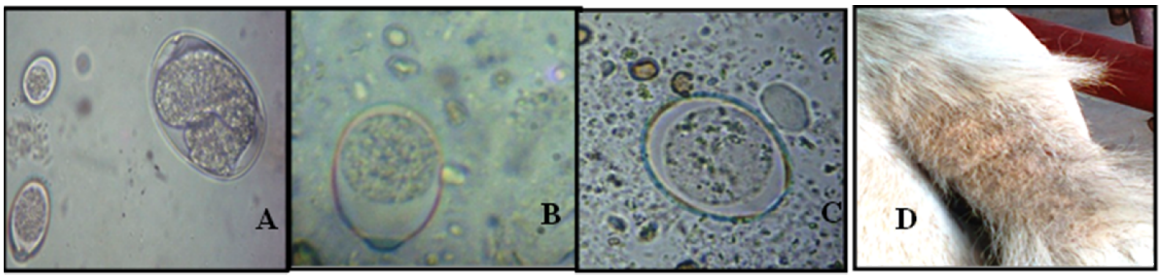

Fig [5].(A). *Egg of Strongyloides papillosus* in sheep(Flotation , 40X) ;(B). Oocyst of *Eimeria sp*. in cattle (C). Oocyst of *Eimeria sp*. in horse (direct smear, 40X) ;(D). Hair loss of horse tail infected by *Oxyuris equi*.

4 DISCUSSION

In the present study, Infection with GI parasites was recorded (86.0%) ,which comes in agreement to Sharma (1998) who reported 29.6 to 100% infection of GI parasite. High percentage of GI parasite in sheep than goat may be attributed to a variety of factors like ground grazing habit of sheep, relatively less cleanliness and extensive pasture grazing compared with goat which grazing at the tip of tree this finding agreement with (Javed, et al.1992 and Margaret, et al.1994). Species of Eimeria recognized in faculty of Vet. Med. of Diyala University are similar to those reported by others (Saleh, 2011; Platzer, et al. 2005; Reeg, et al., 2005 and Al-Kaabi, 2009).

The various species of gastrointestinal parasite recovered during this investigation had already reported by various researchers in different parts of the world (Gadahi, et al.2009) and this variation in prevalence of parasitic infestation depends upon difference in agro climatic condition and availability of susceptible host, management and housing grazing (open or close housing),Radostits,et al.,(2000). The high prevalence rate for Strongyloe sp is consistent with previous findings of other workers (Sardar, et al ., 2006 ; Gadahi, et al.,2009). It was also observed that farms in these areas lack fences and cattle, sheep and goats use the same pasture for grazing.

The breed of sheep and goat show high percentage of GI parasite infection in cross breed than local breed, this may be related to immunity of host this agreed with (Gorski, et al .,2004 and Gadahi, et al.,2009).Whereas, the breed of local cattle show higher prevalence of infection than Friesian cattle this finding may be attributed to a some factor as a less management, open housing grazing, un treated with anthelmintic chemotherapy and Whenever, disagreement with (Sardar,

et al ., 2006) they recorded the maximum rate of infection of gastro-intestinal parasite was recorded in crossbred than native cattle.

High percentage of GI parasite in horse than donkey may be related to the fact that gastrointestinal tract provides favorable environment for the survival and proliferation of many of these parasites (Egan et al., 2010 and Wannas, et al., 2012). On the other hand the higher percentage of coccidiosis in puppy than adult dog may be explained to decrease of immunity ,and age group whenever, the adult dog treated with deworming every 2-3 month . The higher infection of gastrointestinal parasite in young animal than adult may attributed to adults can carry heavy infections but show little evidence.All 4 camels samples examined were found positive for GI parasite infection, these are coincided with the results of other researchers (Rewatkar et al. 2009 and Pwaveno, et al. 2011).

The present study showed that GI parasite is affected in the blood parameters which represented by decrease RBC, PCV, Hb, MCH and MCHC, that causes anemia which differed in severity from mild to severe anemia in infected sheep and goat. These finding may be explained by the presence of the intestinal species of Strongyles type of egg as a blood sucking nematode, Haemonchus contortus. was cause diarrhea, weight loss and loss of appetite and the worms suck blood from the lining of the intestines which causes irritation and swelling of the intestinal membrane .Therefore The damaged mucosa results in malabsorption, impaired digestion and protein loss (Gorski, et al.,2004).

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CONFLICT OF INTEREST

non-declared

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