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SURVEY OF *CRYPTOSPORIDIUM* AND *GIRADIA* INFECTION AND TRIALS OF TREATMENT IN SHEEP AND GOATS AT THE TRIANGULAR AREA (SHALATIN–ABU-RAMAID-HALAEEB) RED SEA GOVERNORATE, EGYPT

(With 5 Tables and One Plate)

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مسح علي الإصابة بالكريبتوسبوردیم والجارديا ومحاولة علاجها في الأغنام والماعز بمنطقة المثلث (شلاتين–أبو رماد–حلايب) محافظة البحر الأحمر، مصر

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تم أجراء هذه الدراسة لمعرفة معدل انتشار مرض الكريبتوسبورديم والجبارديا ومحاولة علاجها في الأغنام والماعز بمنطقة المثلث (شلاتين- أبو رماد –حلايب) محافظة البحر الأحمر، مصر مع إلقاء الضوء علي بعض العوامل الاخري ذات العلاقة بالمرض. تم اخذ عدد ٣٧٤ عينة من براز الأغنام والماعز بعضها يعاني من الإسهال والأخر سليما ظاهريا للفحص. تراوحت أعمار هذه الحيوانات من ١٥يوما إلي أكثر من عام في الفترة من سبتمبر ٢٠٠٨ حتى أغسطس ٢٠٠٩. كان معدل الإصابة بطفيل الكريبتوسبورديم بارفيم ١٥,٨٨% في الأغنام و١٣,٧٥% في الماعز، بينما كان معدل الإصابة بطفيل الجيارديا ديودينالز ٤,٦٧ % في الأغنام و٥ % في الماعز. كذلك لم يتم التعرف علي طور التيروفوزويت بالنسبة للجيارديا في هذه الدراسة. كان معدل الإصابة أعلي في الفئة العمرية من ١٥ يوم حتى ٣ شهور بالنسبة لطفيل الكريبتوسبرديم بارفيم وأكثر من ٣ شهور حتي ٦ شهور بالنسيبة لطفيل الجارديا ديودونالز في الأغنام والماعز علي التوالي. أظهر الفحص أن انتشار المرض اعلي في الحيوانات التي كانت تعاني من الإسهال مقارنة بالسليمة ظاهريا والكبيرة. وأن معدل الإصابة كان اعلي في فصل الشتاء مقارنة ببقية فصول السنة وان محاولات العلاج التي أجريت علي بعض الحيوانات المصابة بالكريبتوسبورديم بارفيم باستخدام بعض المضادات الحيوية أوضحت أن سلفات الباروميمسين ١٠٠ ملجم/كجم من وزن الجسم لمدة ثلاثة إلي خمسة أيام هو الأكثر تأثيرا مقارنة بالمضادات الاخري ، وكذلك كانت محاولات

العلاج بمضادات الديدان المختلفة التي أجريت علي بعض الحيوانات المصابة بالجياردیا ديودونالز أن الفنبندازول ٥٠ ملجم /كجم من وزن الجسم لمدة ثلاثة إلي خمسة أيام هو الأكثر فاعلية مقارنة بالمضادات الاخري المستخدمة في العلاج. حيث أدي العلاج إلي اختفاء الأعراض ، وتحسن الحالة الصحية للحيوانات المصابة. تعتبر هذه أول دراسة تلقي الضوء علي مدي تواجد طفيل الكريبتوسبورديم والجياردیا في الأغنام والماعز بمنطقة المثلث محافظة البحر الأحمر. حيث أن كلا من طفيل الكربتوسبرديم والجياردیا ذات وبائية مهمة بالنسبة للحملان وصغار الماعز المصابة بهما طبيعيا ، ويرجح أن تكون الحملان وصغار الماعز المصابة وعاء للإصابة بالكريبتوسبوبرديم والجياردیا لحيوانات أخري وكذلك الإنسان في هذه المنطقة.

SUMMARY

A study was undertaken to determine the prevalence of *Cryptosporidium spp.* and *Giardia spp.* In sheep and goats in the triangular area (Shalatin – Abu- Ramaid-Halaeeb) Red Sea Governorate, Egypt, and investigate some risk factors. 374 faecal samples from sheep and goats were taken from clinically diarrhoeic and non diarrhoeic animals for examination, aged from 5 days to 1-year-old from September 2008 to August 2009. The prevalence of *Cryptosporidium parvum* oocysts was found to be 34 (15..88%)in sheep and 22(13.75%) in goats. *Giardia duodenalis* cysts were found in 10(4.67%) in sheep and 8(5%) in goats. *Giardia duodenalis trophozoites* were not detected in this study. Infection rates were peaked in the age group 15 d–3 months for *Cryptosporidium Parvum* (group 1 &2) and >3 to ≤ 6 months for *Giardia duodenalis* (group 2&3). The rate of infection was higher in diarrhoeic than non diarrhoeic animals and zero % in adult. The prevalence of both parasites were higher in samples taken during winter season than in samples taken during summer. Trials of treatment with some antibiotic drugs were carried out on some infected animals with *Cryptosporidium parvum* and concluded that paromomycin sulfate (100 mg/kg per day for 3-5 consecutive days) was the drug of choice in treatment of sheep and goats *Cryptosporidium* compared with other antibiotic drugs used. On the other hand trials of treatment with different anthelmintic drugs against natural infection with *Giardia duodenalis* revealed that Fenbendazole (5 mg/ kg of body weight orally once daily for 3-5 days) was the drug of choice in treatment of sheep and goats *Giardiosis* compared with other anthelmintic drugs used. The treatment leads to the disappearance of symptoms, improving the health of infected animals. The study reports for the first time the occurrence of *Cryptosporidium parvum* and *Giardia*

duodenalis in sheep and goats in the triangular area Red Sea Governorate. *Cryptosporidium* and *Giardia* parasites may be of a major epidemiological significance in lambs and kids, and suggests that naturally infected lambs and kids may be reservoirs of *Cryptosporidiosis and Giardia infections* for other animals and even for humans in this region.

Keywords: *Cryptosporidium, giardia, sheep and goats, prevalence.*

INTRODUCTION

The genera *Cryptosporidium* and *Giardia* have been recognized as important enteropathogens in various species of domesticated animals and humans. Infection by these protozoans has been associated with economic losses from the occurrence of diarrhea, and more rarely, death of producing animals (Wade *et al.,* 2000). The protozoan diseases, cryptosporidiosis and *Giardiosis*, are important enteric diseases of sheep and goats, resulting in diarrhea, inefficient weight gains, and occasionally death (Robertson, 2009). Cryptosporidiosis is a widespread, serious economic disease affecting animals who are preweaned, recently weaned, or in unsanitary, stressful, or crowded conditions, as well as after entering feedlots (Foreyt, 1990). The age of the animals is one of the most important risk factors associated with Giardiasis and cryptosporidiosis with young animals being more susceptible to infection than adult ones (Wade *et al.,* 2000). Coccidian protozoon *Cryptosporidium* causes cryptosporidiosis in a wide range of vertebrates, including humans. *Cryptosporidium* is prevalent in sheep and goats and considered to be an important agent in the etiology of neonatal diarrhea syndrome of lambs and goat kids (Causape *et al.,* 2002). It causes considerable direct and indirect economic losses, and morbidity can approach up to 100% in less than six months of age goats and sheep (Abd-El-Wahed, 1999). *Cryptosporidium* is one of the main causes of morbidity and mortality in young livestock, being considered one of the major enteropathogens associated with neonatal diarrhoea in ruminants (De Graaf, *et al.,* 1999). *Cryptosporidium parvum* is a protozoa that can cause diarrhea similar to that of rotavirus infection and can cause diarrhea in lambs and kids 5 to 10 days of age. Affected animals are often active, alert, and nursing. The diarrhea is usually very liquid and yellow (Smith and Sherman, 1994). *Cryptosporidiosis* in sheep and goats is a disease of economic importance characterized by diarrhea and

occasional death as well as progressive weight loss in chronic infection (Misic *et al.*, 2006). Giardiasis is a chronic, intestinal protozoal infection that is seen worldwide in most domestic and wild mammals, many birds, and people. The number of different species and the zoonotic potential of *Giardia spp.* are controversial (Adam, 2001). Giardia-induced diarrhea is more commonly, but not limited to 2 to 4 week old lambs and kids. The diarrhea is usually transient, but infected animals can continue to shed cysts for many weeks, providing a source of infection for other animals and possibly human (Fayer, 1990). There is circumstantial evidence that *Giardia sp.* that infect domestic animals can infect people. It appears that some *Giardia sp.* isolates are infective to a variety of mammals, while others are more species specific. Wild animals may also be reservoirs (Koudela and Vitovec 1998). *Giardia duodenalis* is a well-known enteric protozoan that affects a wide range of domestic and wild animals as well as humans, causing acute, self-limiting, but often severe diarrhea, weight loss, lethargy, and poor condition in young animals and particularly in immunocompromised individuals (O'Handley *et al.*, 1999). *G. duodenalis* has recently emerged as an important parasite in domestic ruminants due to the unexpectedly high levels of infection. In animals, the typical pattern of infection is a peak of faecal shedding of cysts between five and ten weeks of age (Xiao, 1994) and (Thompson, 2000). There is a close association between the prevalence of the *Cryptosporidium* and *Giradia* infection and age of the animal (Olson *et al.*, 2004). Various trials have been developed for treatment and control of *Cryptosporidium a*nd *Giardia* infection in sheep and goats. Mancassala (1995) treated cryptosporidiosis, with most drugs normally used to treat coccidia in kids and lambs. Gladinis *et al.* (2007) studied the effects of halofuginone lactate (100 µg/kg B.W.) for treatment and prevention of cryptosporidiosis in lambs. Viu *et al.* (2000) studied the therapeutic efficacy of paromomycin aminoglycoside antibiotic on natural *Cryptosporidium parvum* infections in lambs and kids. Ryan *et al.* (2006) used azithromycin (a macrolide antibiotic) in the treatment of cryptosporidiosis in immunosuppressed lambs and kids. O'Handley *et al.* (1997) found that Fenbendazole is an effective and economical treatment for Giardia-associated diarrhea and growth rate reduction in lambs. The aim of this study was to estimate the prevalence, age and seasonal distribution of *Cryptosporidium* and *Giardia* infection among sheep and goat at this area.

MATERIALS and METHODS

1- Study area

The study was carried out in rearing sheep and goats in the triangular area which representative the southern part of the Egyptian desert, Climatically, this area is further categorized as semi- arid area characterized by climate with long, dry, hot and windy summers, with short, mild winters and little rain. The mean monthly minimum and maximum temperature vary from 12.4 ± 0.9. °C in January to 28± 1.2 in July and 17.5±.6 °C in January to 45 ±1.9 °C in July respectively, the rainfall is irregular; occurring primarily in winter, and usually does not exceed 3 mm per year.

2- Animals

A total of 214 fecal samples from sheep and 160 from goats were collected, 85 and 66 from adult sheep and goats (over 12 months of age) and 129 and 94 from juvenile sheep and goats respectively (less than 12 months) (Table 2). The juvenile animals were divided into three groups by age: (group 1) 15 d-1 month; (group 2) >1 ≤ 3 months; (group 3) >3 ≤ 6 months. Animals from 1 year onward were classified as adults (group 4) (Table 2). The animals were released in the morning to browse in the shrub jungles and communal pasture for 6–8 h and housed in stilted sheds with wooden slattered floors at night. The lambs and kids were housed with their dams until they were 1–2 months of age in half-walled sheds which were overcrowded and in poor hygiene.

3- Sampling

Fecal samples were collected from sheep and goats from September 2008 to August 2009, Fresh faecal samples were collected per rectum and placed in technically plastic containers. Specimens were stored in a refrigerator at 4 °C. The consistency of the samples was scored as diarrhoeic or non diarrhoeic. In animals with diarrhea, the date of sampling, origin and age, were recorded for each animal.

4- Parasitological examination:

Cryptosporidium infection was diagnosed through faecal examination. Fresh faecal samples were collected directly from the rectum, and marked for identification. After collection, the samples were placed in an ice chest to conserve the material until processing in the laboratory. Faecal samples were concentrated using Sheather's flotation technique in saturated sucrose solution (Garcia *et al.*, 1983). The surface film from the top was transferred with a disposable culture loop on to a

microscope slide and covered with a glass slip. The entire covered area was examined under high power (magnification x 40). The modified Ziehl-Neelsen technique was used for confirmation as it is specialized staining procedure. Fresh faeces and isotonic saline were mixed and spread out on the microscope slide to obtain a homogenous and transparent film. Slides were air dried, fixed in absolute methanol for 3 minutes, stained in cold carbol fuchsin for 10 minutes and decolorized in 3% hydrochloric acid for 1 minute. Then 1% methylene blue was applied for 30 seconds. Rinsed in tap water and air dried. After staining, the faecal smears were observed under an optical microscope, initially at (magnification 40) and then at (magnification 100) for identification of oocysts of *Cryptosporidium sp.* (Henriksen and Pohlenz 1981). Oocyst size was measured using bright field microscopy with a calibrated eyepiece micrometer. Cysts of *Giardia* sp. were found by examining the deposit of a formol-ether concentrate of a faecal preparation (Soulsby, 1982), or floating the sample in Zinc Sulfate, a solution which has been found superior in getting *Giardia* cysts to float (Levine, 1985). Staining the sample with some sort of iodine under the microscope to make the *Giardia* show up easier. Cyst Size was measured using bright field microscopy with a calibrated eyepiece micrometer.

5- Trials of treatment:

Twelve Sheep and goats infected naturally with *Cryptosporidium parvum* were selected. The selected cases were randomly distributed according to their ages into four groups (3 animals per each), animals in 1,2,3, were medicated with Sulphadimidine (Sulphamethazine) (140 mg/ kg of body wt.for 3-5 days orally), Nitrofurazone (25mg./kg of body wt. 3-5 days orally) and paromomycin sulfate (100 mg/kg of body wt. for 3-5 days orally) respectively. Sheep and goats in group four unmediated. Drug efficacy was assessed by evaluating the presence of diarrhea, oocyst shedding and weight gain. Eight sheep and goats naturally infected with *Giardia duodenalis* were selected. The selected cases were randomly distributed according to their ages into four groups (2 animals per each), animals in 1,2,3, were medicated with Fenbendazole (50mg/ 10kg of body wt.3-5 days per os), Albendazole 5% (5 mg /kg of body wt. 3-5 days per os) and Levamisole HCL(5 mg /kg of body wt. 3-5 days orally) respectively. Animals in group four unmediated. Drug efficacy was assessed by evaluating the presence of diarrhea, cysts shedding and weight gain.

RESULTS

Of the examined 214 and 160 faecal samples from sheep and goats 34 (15.88%) and 22(13.75%) contained oocysts of *Cryptosporidium Parvum* from sheep and goats respectively and 10 (4.67%) and 8 (5%) contained cysts *of Giardia duodenalis* from sheep and goats respectively. As for the monoinfection with *Cryptosporidium parvum* oocyst and *Giradia duodenalis* cysts (14.48%) and (3.27%) of the sheep and (13.12%) and (4.37%) in goats were affected (Table1). All samples containing *Cryptosporidium parvum oocyst* came from juvenile animals. No oocysts were detected in feacal samples from adult animals. The- juvenile animals infected with *Cryptosporidium parvum* belonged to groups (1 and 2), where the age range was from 15 days to 3 months, in comparing the overall group of juvenile animals (up to 6 months of age) with the adult animals (more than 1 year of age), we found that juvenile animals more prone to infection by this protozoan (Table 2). *Giardia duodenalis* cysts were found in 10 (4.67%) and 8 (5%) feacal samples in sheep and goats respectively. The infected animals belonged to groups (2 and 3), these covering the age ranges from >1 to ≤6 months. The group of juvenile animals was more affected than the adult groups Table 2. Regarding the prevalence of *Cryptosporidium parvu*m and *Giardia duodenalis* infection in diarrhoeic and non diarrhoeic this investigation revealed that infection were detected in (31.15%) and (8.42%) out of the examined diarrhoeic and (11.76%) and (5.88%) out of the non diarrhoeic sheep. respectively and zero % in adult sheep. In goats *Cryptosporidium parvum* and *Giardia dudodenalis* were detected in (25.67%) and (9.45%), out of the examined diarrhoeic, (15%) and (5%) out of the non diarrhoeic goats respectively and zero % in adult goats Table 3. Seasonality and geography overall prevalence of *Cryptosporidium parvum and Giardia dudodenalis* was higher in samples taken during winter than in samples taken during summer for both parasites In this region (Table 4 and 5).

Morphology of oocyst of *cryptosporidium* and *Giardia* cyst:

Microscopical examination of the acid –fast stained smears revealed ovoid oocysts of *Cryptosporidium* (photo1) measured of 4-6 µm in diameter, the oocysts were spherical to ovoid in shape stained red to pink with a granular appearance against blue background and were surrounded by a halo (*Cryptosporidium parvum).* Microscopical examination of the iodine stained smears revealed *Giardia* cyst (photo2)

is oval cyst measured of 7-11 μm long and 7-9 μm wide, and has a 0.3-μm thick outer wall of a cystic wall. Internally there are two or four nuclei, flagellar, ribosome's and fragments of the ventral disk *(Giardia duodenalis cysts),* trophozoites of *Giardia duodenalis*, were not detected.

Therapeutic trials of treatment: Concerning the efficacy of some antibiotic drugs against natural infection with *Cryptosporidium parvum*, the obtained results revealed reduction in Cryptosporidial oocyst output in three treatments groups in comparison to the unmediated group. On 2nd day of treatment the difference was not clear, while in the 3rd day of treatment all antibiotics showed low reduction in oocyts output. On 4th and-5th days Paromomycin sulfate caused the most rapid fall in the oocysts output compared with other treatment groups and this may refer the efficiency of Paromomycin sulfate as the drug of choice. The efficacy of some anthelimintic drugs against natural infection with *Giardia duodenalis,* the obtained results revealed reduction in *Giardia duodenalis* cysts output in three treatments groups in comparison to the unmediated group. Fenbendazole was 100% effective in eliminating *Giardia duodenalis* cysts from the feces within 3- 5 days compared with the other treatment groups and this may refer the efficiency of Fenbendazole as the drug of choice, besides on hygienic measures, strict sanitation, good management and quarantine of sick animals.

Table 1: Parasites detected in faecal samples of 214 sheep and 160 goats.

Parasites	Number of animals infected		Infection rate (%)	
	Sheep	Goats	Sheep	Goats
Cryptosporidium Sp.	31	21	14.48	13.12
Giardia sp,	7	7	3.27	4.37
Cryptosporidium sp. + *Giardia* sp,	3	1	1.40	0.62

Table 2: Prevalence of *Cryptosporidium* sp. and *Giardia* sp. infections in sheep and goats according to the age.

Age groups	No. of examined animals		Number of infected animals (%)			
			Sheep		Goats	
	Sheep	goats	*Cryptosporidium*	*Giardia*	*Cryptosporidium*	*Giardia*
15 d -1 month	42	32	15(35.71)	-	10 (31.25)	-
>1 ≤ 3 months	43	32	13 (30.23)	6 (18.75)	8 (25)	3 (9.37)
>3 ≤ 6 months	44	30	6 (13.63)	4 (13.33)	4 (13.33)	5(16.66)
>1 year	85	66	-	-	-	-
Total	214	160	34 (15.88	10 (4.67)	22(13.75)	8 (5)

Table 3: Prevalence of *Cryptosporidium* and *Giardia* in examined sheep and goats according to animal status.

Animal status	No. of examined animals		No. of infected animals%			
			Sheep		Goats	
	Sheep	Goats	*Cryptosporidium*	*Giardia*	*Cryptosporidium*	*Giardia*
Diarrheic	95	74	30(31.15)	8(8.42)	19(25.67)	7(9.45)
Non Diarrheic	34	20	4(11.76)	2(5.88)	3(15)	1(5)
adults	85	66	--	--	--	--
Total	214	160	34(15.88)	10(4.67)	22(13.75)	8(5)

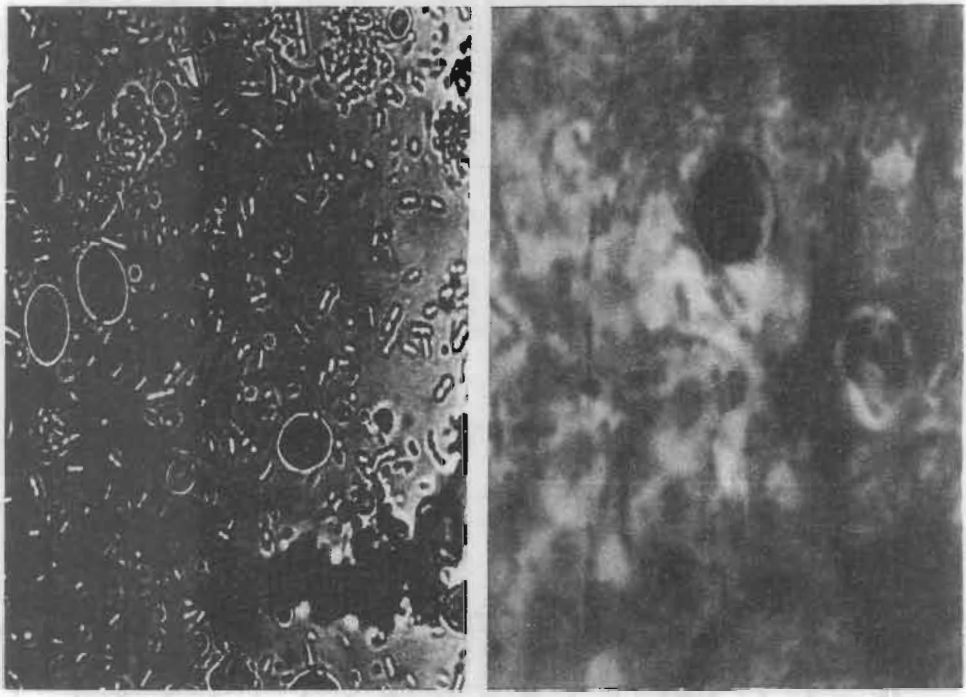
Table 4: Monthly prevalence of *Cryptosporidium* oocyst and *Giardia* cyst excretion by four groups of naturally infected sheep.

months	Group1				Group2				Group3				Group4			
	Crypto. positive animals	%	*Giardia* positive animals	%	*Crypto.* positive animals	%	*Giardia* positive animals	%	*Crypto.* positive animals	%	*Giardia* positive animals	%	*Crypto.* positive animals	%	*Giardia* positive animals	%
September	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
October	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
November	1	2.38	-	-	-	-	-	-	-	-	-	-	-		-	-
December	5	11.9	-	-	4	9.3	-	-	2	4.54	-	-	-		-	-
January	6	14.28	-	-	5	11.62	4	9.3	3	6.81	2	4.54	-		-	-
February	2	4.76	-	-	3	6.97	2	4.65	1	2.27	2	4.54	-		-	-
March	1	2.38	-	-	1	2.32	-	-	-	-	-	-	-		-	-
April	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
May	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
June	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
July	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-
Total	15	35.71	-	-	13	30.23	6	18.75	6	13.63	4	13.33	-	-	-	-

Table 5: Monthly prevalence of *Cryptosporidium* oocyst and *Giardia* cyst excretion by four groups of naturally infected goats

months	Group1				Group2				Group3				Group4			
	Crypto. positive animals	%	*Giardia* positive animals	%	*Crypto.* positive animals	%	*Giardia* positive animals	%	*Crypto.* positive animals	%	*Giardia* positive animals	%	*Crypto.* positive animals	%	*Giardia* positive animals	%
September	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
November	1	3.12	-	-	-	-	-	-	1	3.33	-	-	-	-	-	-
December	3	9.37	-	-	3	9.37	1	3.12	2	6.66	1	3.33	-	-	-	-
January	4	12.5	-	-	4	12.5	2	6.25	1	3.33	3	10	-	-	-	-
February	2	6.25	-	-	1	3.12	-	-			1	3.33	-	-	-	-
March			-	-			-	-	-	-	-	-	-	-	-	-
April	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
June	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
July	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	10	31.25	-	-	8	25	3	9.37	4	13.33	5	16.66	-	-	-	-

Plate 1



1 2

1-Oocysts of *Cryptosporidium parvum* stained with Modified Ziehl–Neelsen stain × 100.

2- Cysts of *Giardia duodenalis* stained with iodine stain × 40.

DISCUSSION

The results of the study demonstrated that *Cryptosporidium parvum and Giardia duodenalis* infection occurred only in some animals raised on both sheep and goats farms. Thus, this is the first report about *Cryptosporidium* and *Giardia* prevalence in sheep and goats in the triangular area (Shalatin- Abu Ramaid –Halaeeb) Red Sea Governorate, Egypt. In the present study a close association between the prevalence of the *Cryptosporidium parvum and Giardia duodenalis* infection and age of the animal was observed, juvenile sheep and goats were more parasitized by *Cryptosporidium parvum and Giardia duodenalis* than adults. These results concur with studies by Nassif *et al.* (2002), El-Gaml *et al.* (2001) and Bomfim *et al.* (2005). The prevalence of infection by *Cryptosporidium parvum* was (32.94%) and (28.12%) in sheep and goats less than 3 months of age and (4.67%) & (5%) for *Giardia duodenalis* in sheep and goats respectively less than 6 months of age. Jos´e *et al.* (2005) and Goma *et al.* (2007) reported that Cryptosporidiosis, caused by *Cryptosporidium parvum*, is primarily a disease of lambs and kids. Misic *et al.* (2006) found a strong correlation between the age and presence of the protozoan in sheep and goat and young animals being more susceptible than adult ones. This observation contrasts the findings reported by other workers who found that the infection was detected in a wide range of age groups extending from 2-week-old to adult animals of more than 1 year Noordeen *et al.* (2000). The differences in the frequency of *Cryptosporidium* and *Giardia* prevalence in sheep and goats raised in different geographical regions can be the result of differences in contamination of the environment with oocysts and cysts of the parasite or different infectivity of *Cryptosporidium and Giardia* sp. populations (Ryan *et al.*, 2005). It is also possible that the quality of zoohygienic conditions of animal husbandry and grazing practices may influence the exposure of animals to *Cryptosporidium* and *Giardia* infection. This can cause considerable direct and indirect economic losses. Our study revealed that both the shedding and intensity of shedding of oocysts and cysts were higher in diarrheic than in non-diarrheic groups of animals, the lowest prevalence of the infection was observed in adult animals (Table 3). These observations are in conformity to El-Gaml *et al.* (2001), Causapé *et al.* (2002), Nasser (2003), Balbir *et al.* (2005) and Nalanozdal *et al.* (2009). The incidence of *Cryptosporidium* and *Giardia* in diarrhoeic young animals might be due to young age which severely affected by the

parasites whereas the young animals were immunologically immature and have greater prevalence of infection and experience more than adults Fayer *et al.* (1990). Though the evidence is insufficient to conclude that this protozoan was the primary cause of diarrhoea since the potential presence of other etiological agents of diarrhoea, especially bacteria and viruses were not examined. Mixed infections with, *Cryptosporidium* and *Giardia sp.* in this study were recorded. These finding agree to large extent with those of Hilali *et al.* (1998), Khalil (2000), Ryan *et al.* (2005) and Nalanozdal *et al.* (2009). Cox (2001) reported that concomitant infections alternatively called mixed infections, are common in the nature, and often involve parasites. Many concomitant protozoal infections in humans and animals were reported. The results of this study confirm that *Cryptosporidium sp.* and *Giardia sp.* exist in sheep and goats in this geographical area should be considered as one of the agents in the aetiology of neonatal diarrhoea in lambs and kids similar to studies in other countries (Inger *et al.,* 2006). Our study showed that the highest prevalence of infection with *Cryptosporidium* and *Giardia* parasites was detected in winter seasons. This result agree with the study reported by Misic *et al.* (2006). Fayer *et al.* (2005) showed that there are substantial differences in prevalence of *Cryptosporidium* and *Giardia* between different years and between seasons, which illustrates the dangers of basing assessments on single years, or on parts of years, because the variations can be large. Therefore, ''snapshots'' representing the size, morphology and morphometry of the oocysts of *Cryptosporidium* and cysts of *Giardia* were consistent with those mentioned for *C. parvum and G. duodenalis* by other workers (Castro-Hermida *et al.,* 2005, Inger *et al.,* 2006 and Santín *et al.,* 2007). On the other hand trophozoites of *Giardia duodenalis* were not detected. These result conformity to Ryan *et al.* (2005) and Misic *et al.* (2006). Concerning the efficacy of some antibiotics and anthelmintic drugs, against natural infection with *Cryptosporidium parvum* and *Giardia duodenalis* the obtained results revealed that paromomycin sulphate was the drug of choice in reducing both cryptosporidial oocyst output and severity of clinical signs compared with the other drugs used in treatment of *Cryptosporidium parvum*. These results agree with those reported by Mancassala (1995), Viu *et al.* (2000) and Ryan *et al.* (2006). Fenbendazole was 100% effective in eliminating *Giardia duodenalis* cysts from the feces and proved successful in preventing natural disease in a controlled clinical field trial in sheep and goat, compared with other anthelmintic drugs used for treatment of *Giardia duodenalis*. These

finding agrees to large extent with those of O'Handley *et al.* (1997) and Majewska *et al.* (2000). Contrast with our results Causape *et al.* (2002) and Misic *et al.* (2003) reported that effective treatments are not available, but because the disease is usually mild and self-limited, supportive care, primarily hydration, is important. Control is strict sanitation and quarantine of sick animals. Disinfection of contaminated housing with ammonia or formalin will kill the oocysts.

Conclusion: The results of the current study demonstrate that *Cryptosporidium parvum and Giardia* duodenalis are involved in the etiology of lambs and kids neonatal diarrhoea and must be considered as a problem. Some factors may be related to the overcrowding and the hygienic conditions of the lambs and kids areas. In view of the public health significance of *cryptosporidiosis*, and g*iardiosis* further studies are needed.

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