

A study of the gastrointestinal parasites in Awassi sheep and surrounding environment

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Abstract

The aim of this study was to investigate the occurrence gastrointestinal parasites in Awassi sheep and the contamination of surrounding environment in ten different locations of Nineveh governorate, during March up to June/2018. A total of 781 of different samples including 231 fecal, 192 soil, 188 feed and 170 water samples were investigated for the detection of ova and oocysts. Traditional parasitic techniques were followed in the study. The results showed that fecal samples were positive for eggs of nematodes, trematodes, and protozoal oocysts 30.63, 9.09, 14.28% respectively. Soil samples were positive for eggs of nematodes, trematodes and protozoal oocysts at 21.35, 10.93, 44.79% respectively. Feed samples declared that contamination with nematodes, trematodes, and protozoal oocysts were 22.34, 26.06, 51.59%, respectively. Examination of water troughs examined, showed that nematodes, trematodes and protozoal oocysts were occurred at 14.11, 8.82, 31.76%, respectively. It concluded that parasitic infection in sheep could attain from different sources, and every effort should be applied to reduce the contamination.

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Introduction

Parasitic infections adversely affect the health, vigor, production, reproduction and performance of livestock with no reciprocal benefit (1,2). Aside from their injuries, some parasites are zoonotic either being accidentally and undeliberately ingested such as fascioliasis and toxicariasis (3). The soil may either serve as a medium for gradual development for a parasite or being dormant avenues for several months or years until being taken by a final host (4). It follows that most infections with parasitizes occur via fecal-oral route of the parasite comprehending the contaminated feed or water (5,6). Several factors contribute the contamination of soil, feed and water with eggs or oocysts as poor animal management, faulty disposal of animal wastes, burial of dead animals in soils adjacent to streams, lakes and watercourses, careless application of rotational grazing (7), ignorance of isolation of sick or suspected animals from the established flock, introduction of

new comer animals to the stable and steady farm without previous quarantine (4). Finally, the usage of common water troughs and feed mangers (8). Globally and locally, comprehensive and detailed studies had emphasized on the epidemiology aspect related to variable prevalence's of gastrointestinal parasitic infections on the animal themselves without references to the influence of environment where animal enclose, live, pasture, breed, delivered, milked, groomed and so on (9). There is a dearth of information on the occurrence at extent of parasite contaminate the environment and its basic elements in Mosul metropolis and their suburbs (8).

The present study was designed to investigate fecal sheep samples and environment samples (water, feed and soil) collected from ten different locations of Mosul city for the detection of gastrointestinal parasites,

Materials and methods

Animal

Awassi sheep farms were selected from ten locations of Nineveh governorate reared in traditional management, extensive and semi- intensive rearing systems for parasitic infection with nematodes, trematodes and protozoa through examination of fecal samples. Examination was also carried out on of feeds, water troughs and soil contaminated with parasitic eggs and oocysts between period from March to June 2018.

Sample collection

A total of 231 fresh samples (approx. 10 g) were directly collected from the rectum of each sheep and placed in plastic bags, transferred to the laboratory of veterinary public Health/college of Veterinary Medicine/ University of Mosul for coprological examinations. One hundred and ninety-two of soil samples (approx. 250g) were collected from depth of about 2 cm in a place not subjected to direct solar rays was obtained using a broad scoop. A total of 188 feed samples (approx. 200g) collected from sheep farms and the samples were kept in clear plastic bags. A total of 170 water samples were collected from troughs in sterile bottle (approx. 1L).

Detection of parasites

Fecal samples were investigated for ova and intestinal oocysts were carried out using flotation and sedimentation techniques as described by (10,11), while the technique of detection of parasites in soil was carried out according to Rai *et al.* (12). Methods followed for detection of parasites in feed and water were done as mentioned by Eraky *et al.* (13), Garcia (14) and Bakir *et al.* (15), respectively. Description and identification of eggs and oocysts were based as described by (10,11).

Statistical analysis

The geographical distribution pattern for the different parasites in this study were relatively clustered in few regions depending on the species of the parasite differences in environmental factors and the flock's density in the different region. A chi-square test to validate additional context for these observation frequencies of parasites dissemination and the various geographical region was employed according to Weiss (16) using the statistical package of the PAST STAT program 2010.

Results

The study included the investigation of parasitic eggs and oocysts in sheep faeces, soil, feed and water. The total samples of the work included 781 samples consisting of 231,192,188 and 170 samples, respectively. The percentages of positive samples in each category were 21.18%, 31.18%, 31.86%, and 15.76% respectively (Figure 1).

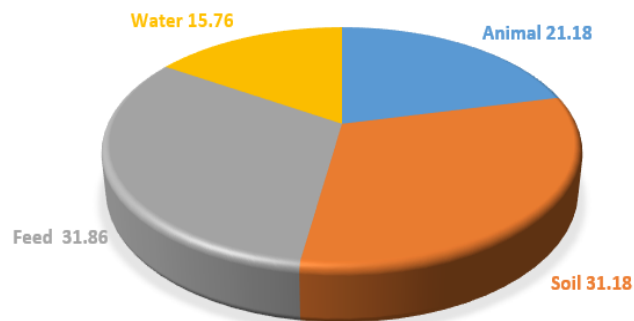


Figure 1: Percentage representation of parasitic contamination in different samples from different locations of Nineveh governorate.

Fecal samples

The presence of parasitic eggs and oocysts of the examined fecal samples of sheep gathered from different locations of Nineveh governorate was shown in table 1. A total sheep infected with nematodes was 30.73%. which was higher than both trematodes and protozoal oocysts 9.09%, 14.28%, respectively. Inspected sheep of all locations recorded positive percentages of nematodes eggs and protozoal oocysts ranged between 23.7% to 40.9% and 8.69% to 27.27% respectively. Detection of trematode eggs was negative in some locations of the governorate and their percentages ranged between 4.34% to 22.72% (Table 1). Statistical analysis of the parasitic percentages in the fecal samples in the areas covered by the study indicate that trematodes eggs among three species showed significant relationship of percentage in different regions.

Soil samples

The soil contamination percentage of nematode eggs was 21.35% ranged from 10.52% - 35.00%, followed by trematode percentage 10.93% ranged from 5% - 15.78%, both of the latter were less than protozoal oocysts percentage of 44.79% ranged from 27.27% - 56.25% (Table 2). Statistical results indicate that there is no significant relationship to the percentages of parasitic contamination of soil in different regions.

Feed samples

The feed contamination being highest percentage of protozoal oocysts was 51.59% with range between 23.52% - 87.50%, while parasitic eggs belonged to nematodes and trematodes were 26.06% ranging from 10.00% - 40.00%, followed by nematodes 22.34% ranging from 22.34% - 37.50% in different examined locations (Table 3). Statistical analysis of parasitic contamination percentages of feed samples in different pastures referred a significant relationship in different regions.

Table 1: Number and percentages of eggs and oocysts detected in sheep faeces

No.	Locations	No. samples examined	Eggs(Ova)				oocysts	
			Nematodes		Trematodes *		Protozoa	
			No. +Ve	%	No. +Ve	%	No. +Ve	%
1	Ali-rash	21	7	33.33	-	-	3	14.28
2	Kokjali	26	9	34.91	4	15.38	5	19.23
3	Al-Rahmania	20	5	25.00	2	10.00	3	15.00
4	Shamsiat	22	6	27.27	2	9.00	2	9.09
5	Khor-sibat	22	8	36.36	4	18.18	3	13.6
6	Abasia	25	6	24.00	-	-	3	12.00
7	Shalalat	23	7	30.43	1	4.34	2	8.69
8	Muwali	26	6	23.70	-	-	3	11.53
9	Msherfa	24	8	33.33	3	12.50	3	12.5
10	Rashidia	22	9	40.90	5	22.72	6	27.27
Total		231	71	30.73	21	9.09	33	14.28

* Indicating that there is a significant relationship between the occurrence rat and different regions

Table 2: Number and percentages of eggs and oocysts detected in the soil samples examined

No.	Locations	No. samples examined	Eggs(Ova)				oocysts	
			Nematodes		Trematodes *		Protozoa	
			No. +Ve	%	No. +Ve	%	No. +Ve	%
1	Ali-rash	22	3	13.63	3	13.63	6	27.27
2	Kokjali	20	3	15.00	1	5	10	50.00
3	Al-Rahmania	19	2	10.52	1	5.26	7	36.84
4	Shamsiat	16	4	25.00	2	12.50	9	56.25
5	Khor-sibat	20	7	35.00	3	15.00	8	40.00
6	Abasia	22	5	22.72	2	9.09	11	50.00
7	Shalalat	18	4	22.22	2	11.11	10	55.55
8	Muwali	19	4	21.05	3	15.78	9	47.36
9	Msherfa	17	5	29.41	2	11.76	7	41.17
10	Rashidia	19	4	21.05	2	10.52	9	47.36
Total		231	192	41	21.35	21	10.93	86

Table 3: Number and percentages of eggs and oocysts detected in feed samples examined

No.	Locations	No. samples examined	Eggs(Ova)				oocysts	
			Nematodes		Trematodes *		Protozoa	
			No. +Ve	%	No. +Ve	%	No. +Ve	%
1	Ali-rash	17	4	23.52	5	29.41	4	23.52
2	Kokjali	19	2	10.52	3	15.78	12	63.15
3	Al-Rahmania	16	4	25.00	3	18.75	7	43.75
4	Shamsiat	20	6	30.00	2	10.00	10	50.00
5	Khor-sibat	21	4	19.04	7	33.33	10	47.61
6	Abasia	20	5	25.00	8	40.00	8	40.00
7	Shalalat	16	6	37.50	6	37.50	14	87.50
8	Muwali	20	3	15.00	8	40.00	12	60.00
9	Msherfa	22	3	13.63	5	22.72	9	40.90
10	Rashidia	17	5	29.41	2	11.76	11	64.70
Total		188	42	22.34	49	26.06	97	51.59

* Indicating that there is a significant relationship between the occurrence rat and different regions

Water samples

Water parasitic contamination percentage with protozoal oocysts was 31.76% ranging from 10% - 57.89%. Nematode eggs in water samples were recovered at percentage of 14.11% ranging between 5.55 - 35.71% with some negative results, followed by trematode eggs percentage of 8.82% ranging from 6.25 - 27.77% in different examined locations, with some negative results (Table 4). With regard to the percentages of parasites contamination of water in different regions, there was a significant relationship in the percentages of trematode eggs and protozoal oocysts.

Parasitic genera recorded

The percentage of nematode genera in animals were in a descending manner as follows: *Ostertagia* 16.89%, *Nematodirus* spp.14.95%, *Hemonchus* spp. 10.80%, *Trichostrongylus* spp.9.69%, *Chabertia* spp.7.47%, *Strongyloides* spp.5.26%, *Bunostomum* spp.2.21%,

Oesophagostomum spp.1.38%, *Trichuris* spp.1.10% and lastly *Gongylonema* spp.0.55% (Table 5).

In other samples of soil, feed, and water the distribution of recorded parasitic genera were to a large extent similar to that genera recorded in animals and *Ostertagia* being still the predominant in all examined samples from animal, environmental sources (soil and water) and feed commodities (Table 5). In the opposite manner was the picture of trematodes (*Fasciola* spp.) in fecal samples gained from animals and the percentage of their recovery was the lowest among other environmental (soil and water) and feed samples, being 4.70%, 29.66%, 12.7% and 20.47% respectively (Table 5). In the same line were the results of protozoal oocysts in the examined samples as trematodes, with a high percentage in soil 50.7%, water 45.76%, and in feed 47.61%, compared with the samples taken from animal (fecal samples) of 21.05% (Table 5).

Table 4: Number and percentages of eggs and oocysts detected in water samples examined

No.	Locations	No. samples examined	Eggs (Ova)				oocysts	
			Nematodes		Trematodes *		Protozoa	
			No. +Ve	%	No. +Ve	%	No. +Ve	%
1	Ali-rash	15	2	13.33	0	-	2	13.33
2	Kokjali	15	3	20.00	0	-	5	33.33
3	Al-Rahmania	14	5	35.71	2	14.28	7	50.00
4	Shamsiat	19	3	15.78	0	-	11	57.89
5	Khor-sibat	16	0	-	1	6.25	8	50
6	Abasia	18	2	11.11	2	11.11	5	27.77
7	Shalalat	20	4	20.00	3	15	2	10.00
8	Muwali	20	0	-	0	-	5	25.00
9	Msherfa	18	1	5.55	5	27.77	3	16.66
10	Rashidia	15	4	26.66	2	13.33	6	40.00
Total		170	24	14.11	15	8.82	54	31.76

* Indicating that there is a significant relationship between the occurrence rate and different regions

Table 5: Parasitic genera recovered from different examined samples

No.	Class	Type of parasite	% Animal	% Soil	% Feed	% Water
1	Nematode	<i>Bunostomum</i> spp.	2.21	0.95	1.42	0.84
2		<i>Chabertia</i> spp.	7.47	1.43	1.90	4.23
3		<i>Hemonchus</i> spp.	10.80	2.39	2.85	3.38
4		<i>Nematodirus</i> spp.	14.95	2.87	4.76	8.47
5		<i>Oesophagostomum</i> spp.	1.38	0.47	0.95	0.85
6		<i>Ostertagia</i>	16.89	7.65	11.42	14.41
7		<i>Strongyloides</i> spp.	5.26	1.43	2.38	2.54
8		<i>Trichostrongylus</i> spp.	9.69	1.91	3.80	2.54
9		<i>Trichuris</i> spp.	1.10	0.47	1.42	0.00
10		<i>Gongylonema</i> spp	0.55	0.00	0.95	1.70
11	Trematoda	<i>Fasciola</i> spp	4.70	29.66	20.47	12.7
12	oocyst	<i>Eimeria</i> spp	21.05	50.71	47.61	45.76

Discussion

The harmful effects of parasites could possibly be noticed in sheep rather than cattle (17), and considered the greatest agent adversely influencing animal husbandry. The positive and high levels of parasitic eggs and oocysts in the samples taken from sheep or their environment, such as water, soil, and also from feeds, may be due to the fact that this study was carried out during spring season, which is favorable to point of optimal temperatures and humidity for increasing parasitic infections. The effects of environment appear plain relating to the presence of infective stages of helminthes which may be exaggerated with certain malpractice regarding to poor hygiene and malnutrition conditions which result in greater exposure, since gastrointestinal parasites prevail in temperate, sub-tropic and tropical countries. However, it is most common in warm humid countries due to improper sanitation and poor standard of living (18). Urban and peri-urban livestock keeping have a profession of animal raising as a source of livelihood by small householders especially those in developing countries (19). The most principle causes of high parasitic contamination recorded in animals, their feeds and environments in our study and in some locations rather than others, could be attributed to the presence of fixed flocks in those areas of high contamination percentages (20).

The obtained findings in our study were related to the detection of relatively slight helminth eggs was similar to those reported in Mosul earlier, which ranged between 7.45-15.72% (21). However, the presence of protozoal oocysts in sheep feces was much lower than the reported by Hussein (22). However, the intestinal protozoa in sheep feces may range from 42.85% (21) to 63.6% (23). Some infected animals manifest asymptomatic or show only slight signs, so they may be mostly overlooked till serious squeals or apparent clinical symptoms appear (24). Age of animal play an important role i.e kids shed more than adult (25). In Dohuk, a neighboring province to Mosul and in Abu Ghraib district a suburb of Baghdad, the mean coprological trematode of sheep was 13.6% and 2.7% (9,25), respectively, which is quite identical to our findings.

The differences in percentage of fecal oocyst detection among studies may be related to season study, husbandry practice and climatic conditions of each local region which are highly influenced by daily temperature and relative humidity affecting the live cycle of protozoa. However, such findings are unfortunate because light infection have negative effects on animal health and its economic status because subclinical infections hinders animal's growth and production, making the animal more apt to other pathogens as well as being a source and spread or persistent contamination of the field (26,27). As mentioned earlier, the management followed in the current study was the extensive and semi-intensive system commonly known as "semi-arid range land" in which the breeding sheep were allowed to

roam and feed themselves and turn back to the owner's homestead at night where they are collected, tied and tethered indoor. During the rainy season, sheep were semi-intensively managed and grazing takes place from early morning till late evening. Such organization limits and lessens the sheep to the exposure to parasite contamination, however, the latter condition "intensive system" proceeds more parasite occurrence due to excessive chance to pick up the ova and cyst from the closed flock (28).

The findings of soil contamination showed that slight helminthic eggs prevail which ranged between 5-35% with the lowest contamination in favor of trematodes. However, moderate uniform and homogeneous contamination of soil with protozoal oocysts were found ranging from 27.27-56.25%. It is known that soil is the most indicator of parasitic risk. Our observations indicated that the soil of different location was contaminated with several types of eggs and oocysts. The role of soil is crucial since the parasites in the contaminated soil may get access to the grass, pasture, green forage and hence, transmission of parasitic diseases to grazing ruminants may occur. The moving of herds to different localities with different load of parasitic infection could distribute infectious agent to large areas (29). Furthermore, incorrect treatments and the frequent use of drugs and antibiotics may have an effect on manifesting some resistance by parasitic organisms and thus prolonging their perpetuation and survival (30).

According to the characters obtained by (10,11) several types of eggs of nematodes and *Fasciola* were detected in all the findings of the study elements with different ratios, referring the higher percentages in feces as compared to other study elements. This outcome is comparable to many epidemiological surveys and fauna parasites all over Iraq (21,29).

The higher prevalence of nematode's eggs as compared to trematodes may account to the ability of these eggs to survive and withstand drought and adverse conditions which are characters of nematode eggs (31). Our findings were similar to those of (8) who found that the mean total prevalence of nematode and trematode eggs in different soils of Mosul quarters were 19.54% and 32.2%, respectively. In Brazil (32) reported that out of 2520 sandy soil sample analyzed, 18.2% were contaminated by several helminthic eggs. The survival, sustenance, development and perpetuation of parasitic ova, cysts and oocysts depend upon suitable standards i.e. ambient temperature, relative humidity, dryness, pH, soil depth, structure and constitution (33), the unrestricted availability of the intermediate host(s) and the liberal existence of the final host(s) which ultimately determine the occurrence of an infection.

Water and feed may be contaminated with a variety of parasitic agents which play an important role in the consequent distribution of parasitic infections (1). Due to their type of management, sheep have never been widely kept in intensive, confined management and the extensive

system of animal feeding operations, is followed (34,35). Hence, feed and water troughs should be built high enough to avoid heavy fecal contamination. Furthermore, to avoid getting infection directly from the soil, animals should be fed from standard feeders in the shed. Also, water should be clean and free of fecal matter and working areas should be constructed in well-drainage places, and these animal must be prevented from the approach to probable parasite infected water bodies. Pasture rotation and rest should be followed in which rotational grazing practice with a sufficient pasture rest period is greatly required for better pasture management to lessen parasitic contamination. High fed and water parasite contamination were reported in the current study which were different from a related work carried out in the same region which showed lower egg parasitic prevalence of these two items (29).

Adult sheep produce between 1-3 Kg feces on a daily basis assuming that such animal possibly present a potential for environmental contamination particularly to water catchment and less to the pasture (36). Drinking water used for animal may serve as a reservoir or even a vector or carrier of several parasites due to bathing, washing, wallowing, grooming, fishing or other activity involving contact with water that has been contaminated by feces (37). The statistical analysis of the present study indicated a significant relationship among some regions *i.e.* feces, feed and water samples.

These findings could be attributed to the variation in the environmental and geographical, topographic conditions, climatic items, temperature, relative humidity and rainfall levels, as well as flock density and lack or absence of strategic treatments of both the land and/or the animal *i.e.* singeing of the post harvested lands and rotational grazing or the animal itself representing by regular and constant administration of anthelmintic (8,9,38,39).

Conclusions

Parasitic infection in all animals including sheep is a complicated issue, and it does not attribute to one source or origin of infection or contamination, but it is a multi-infectious sources that could play individually or altogether in establishing light or heavy parasitic infections. However, it should be stressed that measures are needed to control parasitic infections which requires an accurate description of the epidemiological characters with unique continuous monitoring.

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Conflict of interest

On behalf of all co-authors, the submitted manuscript is the author's original work, has not received prior publication and is not under consideration for publication elsewhere. Permission has been received to use any material in the manuscript much as tables, figures etc. or no permissions have necessary to publish the authors work. The authors declare that they have no competing interests, did not receive any financial support and did not infringe on others' ideas.

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دراسة طفيليات المعدة والأمعاء في أغنام العواسي والبيئة المحيطة بها

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الخلاصة

هدفت الدراسة الحالية للتقصي عن حدوث الطفيليات المعوية في أغنام العواسي والبيئة المحيطة بها في عشرة مناطق مختلفة من محافظة نينوى للفترة من آذار ولغاية حزيران ٢٠١٨. جمعت ٧٨١ عينة مختلفة شملت ٢٣١ عينة براز و ١٩٢ عينة تربة و ١٨٨ عينة علف و ١٧٠ عينة ماء للتحري عن بيوض واكياس البيض الطفيلية. استخدمت الطرق التقليدية في كشف وتشخيص البيوض واكياس البيض الطفيلية. أظهرت النتائج ان عينات البراز كانت موجبة لبيوض الديدان الإسطوانية والمتقوبات وأكياس البيض للالوالي الطفيلية بنسبة ٣٠,٣٦ و ٩٠,٠٩ و ١٤,٢٨% على التوالي. اما عينات التربة فكانت موجبة لبيوض الديدان الإسطوانية والمتقوبات وأكياس البيض للالوالي الطفيلية بنسبة ٢١,٣٥ و ١٠,٩٣ و ٤٤,٧٩% على التوالي. وظهرت عينات العلف وجود ثلوث ببيوض الديدان الإسطوانية والمتقوبات وأكياس البيض للالوالي الطفيلية بنسبة ٢٢,٣٤ و ٢٦,٠٦ و ٥١,٥٩% على التوالي. وظهرت نتائج فحص الماء وجود ببيوض الديدان الإسطوانية والمتقوبات وأكياس البيض للالوالي الطفيلية بنسبة ١٤,١١ و ٨,٨٢ و ٣١,٧٦% على التوالي. خلصت الدراسة الحالية الى ان الأغنام قد تكتسب الإصابة بالطفيليات من مصادر مختلفة من البيئة ويجب ان تتضافر الجهود لتقليل نسبة الإصابة بها.