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Prevalence of gastrointestinal helminths infesting sheep in Qalyubia governorate, Egypt.

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ABSTRACT

The objective of this study was investigation the prevalence of gastrointestinal helminths among sheep in Qalyubia Governorate, Egypt. A total of 830 grazing sheep, native breed, both sexes, 6-36 months old, were examined for the presence of gastrointestinal helminths during the period from January to December 2019. Fecal Samples from all sheep were parasitologically examined. The current study revealed that a total prevalence was 71.44%, the highest (P<0.05) seasonal prevalence was recorded in autumn (95.75%) followed by winter (67.98%) while summer showed the lowest prevalence (58.81%). The total prevalence of single infection was 50.00%. The highest significant (P<0.05) single prevalence was recorded by Trichostrongylus spp. (41.70%), while the lowest prevalence was by Avitellina spp. (1.90%). The total prevalence of mixed infestation with different helminths species was 34.20%. Fecal culture examination of positive feces revealed that Trichostrongylus spp. and Chabertia ovina were the least prevalent larvae (24.20% and 10.80%, respectively). There was no significant effect of sex on the prevalence. Sheep of six months to one year old expressed a high prevalence (84.80%), but sheep > 2 years old had a relatively low infection (52.20%). In conclusion, it was noted that gastrointestinal helminths are endemic at high levels among sheep in the study area and need great effort to control these parasites.

1. INTRODUCTION

In Egypt, sheep breeding forms a great part of the agricultural economy, where animals are raised mostly in rural farmers. Egyptian sheep are important animal genetic resources, they are raised basically for mutton production, while wool and milk consider as secondary products (FAO, 2017). They are the third source of red meat in Egypt after cows and buffaloes, which considered the strategic stockpile of food security (El-Malky et al., 2019). Sheep are also very important for resource-poor smallholder systems due to their ease of management, short generation cycles and high reproductive rates which lead to high production efficiency and significant role in provision of food and generation of cash income from the export of meat, live animals and skins (Anonymous et al., 2005).

Gastrointestinal helminths cause huge economic losses in small ruminants' production worldwide (Cala et al., 2012). They have direct life cycles, mostly invade digestive tract, abomasum and small intestines (Hansen and Perry, 1994) obtaining nutrition and shelter from their animal host and resulting in poor growth rate, reduced fertility, less immunity, damaged gastric function, high mortality of 28% of small stock and weight loss 3-8 % causing US$ 2 billion per annum in many countries in Europe (Eguale et al., 2007). Despite the importance of GIH economically little studies were done on the prevalence of GIH in sheep in Qalyubia governorate. So, in this study we conducted a survey to determine the prevalence of gastrointestinal helminths of sheep in Qalyubia governorate, the prevalence of single and mixed infection and effect of age, sex, and season on their prevalence.

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2. MATERIAL AND METHODS

All procedures used in this experiment were approved by the institutional animal care and use committee of Benha University and followed the guidelines of the National Institute of health in Egypt (Ethical No. BUFVTM38-10-22)

2.1. Prevalence of gastrointestinal helminths infecting sheep
2.1.1. Animals.
From different localities in Qalyubia governorate (Benha, Toukh and Shebin El Kanater), a total of 830 grazing sheep, native breed, both sexes, 6-36 months old, were examined for the presence of gastrointestinal helminths during the period from January to December 2019.

2.1.2. Collection of the fecal samples.
Fecal samples were collected directly from rectum of each of examined sheep in plastic bags, labeled with data that include date of infection, sex, age, breed, and observed clinical signs. Each sample was parasitologically examined as soon as possible in the same day for the presence of gastrointestinal helminths.

2.2. Parasitological examination
2.2.1. Microscopic examination.
To examine the fecal samples for gastrointestinal helminths (GIH) eggs or larvae

2.2.2. Qualitative examination of the fecal samples.
2.2.3. Concentration floatation method (Soulsby 1986)
2.2.4. Concentration sedimentation method (Soulsby 1986)

2.2.5. Quantitative examination of the fecal samples:
It was done by Mc master technique according to Soulsby (1986) to determine the degree of infestation by counting the egg per gram (EPG) feces as follows.

$$EPG = \frac{total\ number\ of\ eggs}{total\ number\ of\ counting\ chamber} \times 100$$

2.3. Fecal culture for gastrointestinal nematodes
Fecal culture was carried out for identification of 3rd larval stage of trichostrongylids.
Ten positive fecal samples of gastrointestinal eggs were subjected to fecal cultures monthly according to Georgi and Georgi (1990).

2.3.1. Collection of larvae after fecal culture.
The larvae were collected using a modified Bearmans technique after Thomas et al. (1970)

2.3.2. Identification of larvae
Identification of gastrointestinal nematodes larvae was done according to Georgi and Georgi (1990), the body length, length of tail sheath, the shape of intestinal cells and length of caudal sheath filament extension were identified.

2.4. Statistical analysis
ANOVA was done with two factors under significance level of 0.05 for the entire result using SPSS (Ver. 25). (Steel et al., 1997). Data were dealt as a complete randomization outlines and different examinations were done applying LSD (low standard deviation).

3. RESULTS

The present study showed that the prevalence of gastrointestinal helminths among examined sheep (n= 830) was 71.4%, the highest prevalence was significantly (P<0.05) recorded in October and December (100%), while April showed the lowest prevalence (56.4%) (Table 1).
Regarding the seasonal prevalence of GIH, the highest prevalence was significantly (P<0.05) recorded in autumn (95.75%) followed by winter and spring (67.98% and 64.13%) respectively, while summer showed the lowest significant prevalence (58.81%) (Table 2)
Concerning single and mixed infection, the total prevalence of single infection was (50%). The highest significant single prevalence (P<0.05) was recorded by Trichostrongylus spp. (41.7%) followed by Moneizia spp. (14%), Neoascaris vtillorumspp. (4.6%) and Trichuris spp. (3.7%). While the lowest prevalence was recorded by Avitellina spp. (1.9%). The total prevalence of mixed infestation with different helminths species was 34.2%. The prevalence of Trichostrongylus spp. was significantly the highest (P<0.05) in February (53.3%), and the lowest prevalence was recorded in May and June (17.8%and 15.6%; respectively), Trichuris spp. was recorded in April (23.6%) and September (13.8%) only, Neoascaris vitulorum spp. was recorded only in December (25.4%) and March (16.7%), the highest significant prevalence of Moniezia spp. was recorded in November (31.4%) followed by January (24.3%), while the lowest prevalence was recorded in August (3.2%). Avitellina spp. was recorded only in June (24.4%). (Table 3, Plate 1).

Table 1 Monthly prevalence of gastrointestinal helminths among sheep

	No. of total examined	No. of Total infected	%	No. single infected	%	No. Mixed infected	%
January	103	83	80.6 ^{b}	63	61.1 ^{Ab}	20	19.4 ^{Dd}
February	90	48	53.3 ^{f}	48	53.3 ^{Ab}	0	0.0 ^{Be}
March	60	41	68.3 ^{cd}	25	41.6 ^{Ac}	16	26.7 ^{Bc}
April	55	31	56.4 ^{ef}	22	40 ^{Ac}	9	16.4 ^{Cd}
May	45	32	71.1 ^{c}	18	40 ^{Ac}	14	31.1 ^{Bb}
June	45	30	66.7 ^{d}	18	40 ^{Ac}	12	26.7 ^{Bb}
July	60	36	60.0 ^{e}	20	33.3 ^{Ad}	16	26.7 ^{Bb}
August	95	32	33.7 ^{g}	13	13.7 ^{Be}	19	20.0 ^{Ac}
September	65	57	87.7 ^{a}	31	47.7 ^{Ac}	26	40.0 ^{Ba}
October	75	75	100.0 ^{a}	46	61.3 ^{Ab}	29	38.7 ^{Bc}
November	70	61	87.1 ^{b}	39	55.7 ^{Ab}	22	31.4 ^{Bc}
December	67	67	100.0 ^{a}	47	70.1 ^{Aa}	20	29.9 ^{Cd}
Total	830	593	71.4	390	50 ^{A}	203	34.2 ^{C}

Table 2 Seasonal prevalence of gastrointestinal helminths among sheep

	No. examined	No. infected	%
Winter	253	172	67.98 ^{b}
Spring	145	93	64.13 ^{bc}
Summer	220	125	58.81 ^{c}
Autumn	212	203	95.75 ^{a}
Total	830	593	71.45

Percentage within each column not sharing superscripts are significant *(P<0.05).*

Table 3 Monthly prevalence of helminths eggs among infected sheep

	Total No of examined samples	Trichostrongylid Eggs		Trichuris Eggs		Neoascaris eggs		Moniezia Eggs		Avitellina Eggs	
		No. infected	%	No. infected	%	No. infected	%	No. infected	%	No. infected	%
January	103	38	36.9 ^{Bb}	0	0.0 ^{Dc}	0	0.0 ^{Db}	25	24.3 ^{Ca}	0	0.0 ^{Db}
February	90	48	53.3 ^{Aa}	0	0.0 ^{Bc}	0	0.0 ^{Bb}	0	0.0 ^{Bd}	0	0.0 ^{Bb}
March	60	15	25.0 ^{Bbc}	0	0.0 ^{Cc}	10	16.7 ^{Ba}	0	0.0 ^{Cd}	0	0.0 ^{Cb}
April	55	9	16.4 ^{Ccd}	13	23.6 ^{Ba}	0	0.0 ^{Db}	0	0.0 ^{Dd}	0	0.0 ^{Db}
May	45	8	17.8 ^{Dd}	0	0.0 ^{Ec}	0	0.0 ^{Eb}	10	22.2 ^{Ca}	0	0.0 ^{Eb}
June	45	7	15.6 ^{Cd}	0	0.0 ^{Dc}	0	0.0 ^{Db}	0	0.0 ^{Dd}	11	24.4 ^{Ba}
July	60	12	20.0 ^{Cc}	0	0.0 ^{Ec}	0	0.0 ^{Eb}	8	13.3 ^{Db}	0	0.0 ^{Eb}
August	95	10	10.5 ^{Cc}	0	0.0 ^{Ec}	0	0.0 ^{Eb}	3	3.2 ^{Dc}	0	0.0 ^{Eb}
September	65	22	33.8 ^{BCb}	9	13.8 ^{Db}	0	0.0 ^{Eb}	0	0.0 ^{Ed}	0	0.0 ^{Eb}
October	75	31	41.3 ^{Bb}	0	0.0 ^{Dc}	0	0.0 ^{Db}	15	20.0 ^{Cb}	0	0.0 ^{Db}
November	70	17	24.3 ^{BCcd}	0	0.0 ^{Dc}	0	0.0 ^{Db}	22	31.4 ^{Ba}	0	0.0 ^{Db}
December	67	30	44.8 ^{Bb}	0	0.0 ^{Dc}	17	25.4 ^{Ca}	0	0.0 ^{Dd}	0	0.0 ^{Db}
Total	830	247	41.7 ^{B}	22	3.7 ^{E}	27	4.6 ^{E}	83	14.0 ^{D}	11	1.9 ^{F}

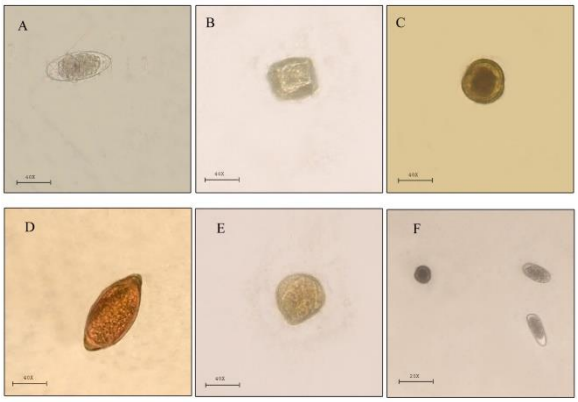

Plate 1 Different helminths species eggs recorded by fecal examination. A: Trichostrongylid spp egg. B: Moniezia spp egg. C: Neoascaris vitulorum egg. D: Trichuris spp. egg. E: Avitellina spp. egg. F: mixed infection by Trichostrongylidae and Neoascaris vitulorum spp eggs.

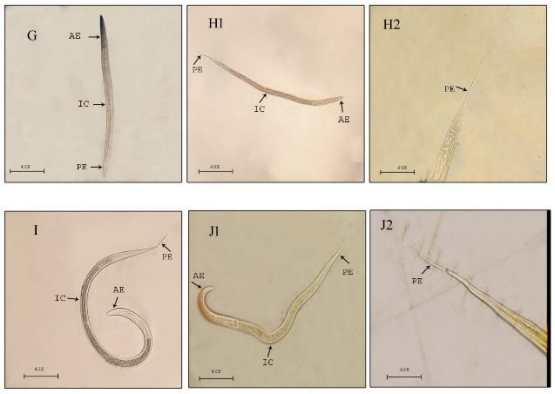

Plate 2 Different third larval stages recorded by fecal culture examination. G: Trichostrongylus spp. L3. H1: Oesophagostomum spp. L3. H2: Oesophagostomum spp. L3 tail sheath. I: Haemonchus spp. L3. J1: Cabertia ovina L3. J2: Cabertia ovina L3 tail sheath. AE →Anterior end. IC→ Intestinal cells. PE→ Posterior end

After fecal culture examination of positive feces, the present study showed that the most prevalent larva ($P<0.05$) was Trichostrongylus spp. (24.2%), followed by Oesophagostomum and Haemonchus spp. (15.8% and 14.2%; respectively), the least significantly predominant larva was Chabertia ovina (10.8%). Mixed larval infection was recorded in 35% of the examined fecal samples. The highest prevalence of Trichostrongylus spp., Chabertia ovina, Oesophagostomum spp., Haemonchus spp. larvae were significantly ($P<0.05$) recorded in February, April, December, and August /September (70, 40, 50, 50; respectively) (Table 4).

The morphometric characters of L3 stage of the recorded species were as follow:

Trichostrongylus spp. L3 length ranges from 600 -700 U, it has a short tail sheath (25-30 µ) without sheathed tail filament and there are 16 intestinal cells. (Plate 2G)

Oesophagostomum spp. L3 is 750 -950 U, it has a long tail sheath (120-170 µ) with a very long sheath filament and there are 24-32 intestinal cells (Plate 2H1, H2)

Haemonchus spp. L3 is 650- 750 µ, it has a medium tail sheath (40-80 µ), a slightly curved tail sheath base with small sheath filament and there are 16 intestinal cells. (Plate 2I)

Chabertia ovina L3 is 700-800 µ, it has long tail sheath (100-150 µ), with a long sheath filament and there are 24-32 intestinal cells. (Plate 2J1, J2)

Regarding the effect of sex on the prevalence of GIH infection, the current study showed that there is no significant difference ($P>0.05$) in the total prevalence between males and females. The highest significant prevalence in male was recorded in autumn (97.3%) and there were no significant differences were encountered in winter, spring and summer (66.7%, 66.7% and 60.9% respectively). The highest significant prevalence of GIH infection in female was recorded in autumn (94.1%), while lowest significant prevalence was recorded in spring and summer (61.4% and 52.4%) respectively (Table 5).

Considering the effect of age of the examined sheep on the prevalence of GIH, the present study showed that the highest prevalence ($P<0.05$) was recorded in sheep at the age of 6 months-one year (84.8%), followed by sheep at the age of one-two years (75.6%). The lowest significant prevalence was recorded in sheep > 2 years old (52.2%). Seasonally, the highest significant prevalence in sheep at the age of 6 months to one year was recorded in autumn (96.7%), while the lowest significant prevalence was recorded in winter (71.4%). The highest significant prevalence in sheep at the age of one- two years was recorded in autumn (98.1%), while the lowest significant prevalence was recorded in winter (87.4%). The highest significant prevalence in sheep > 2 years old was recorded in autumn (88.9%), while no significant difference ($P>0.05$) was recorded in winter, spring, and summer (40%, 51.4% and 42.9%, respectively) (Table 6).

Table 4 Monthly prevalence of Trichostrongylid larvae in cultured fecal samples of the infested sheep

	Trichostrongylus species larvae		Chabertia ovina larvae		Oesophagostomum species larvae		Haemonchus larvae		Mixed	
	No. Infected	%	No. Infected	%	No. Infected	%	No. Infected	%	No. Infected	%
January	4	40.0% ^{Ab}	0	0.0% ^{Ce}	2	20.0% ^{Bc}	0	0.0% ^{Cd}	4	40.0% ^{Ac}
February	7	70.0% ^{Aa}	2	20.0% ^{Bc}	0	0.0% ^{De}	0	0.0% ^{Dd}	1	10.0% ^{Cf}
March	3	30.0% ^{Bc}	0	0.0% ^{De}	2	20.0% ^{Cc}	0	0.0% ^{Dd}	5	50.0% ^{Ab}
April	2	20.0% ^{Bd}	4	40.0% ^{Aa}	0	0.0% ^{Ce}	0	0.0% ^{Cd}	4	40.0% ^{Ac}
May	2	20.0% ^{Bd}	0	0.0% ^{Ce}	0	0.0% ^{Ce}	4	40.0% ^{Ab}	4	40.0% ^{Ac}
June	0	0.0% ^{Ce}	0	0.0% ^{Ce}	4	40.0% ^{Ab}	3	30.0% ^{Bc}	3	30.0% ^{Bd}
July	3	30.0% ^{Bc}	0	0.0% ^{De}	1	10.0% ^{Cd}	0	0.0% ^{Dd}	6	60.0% ^{Aa}
August	2	20.0% ^{Bd}	0	0.0% ^{Ce}	0	0.0% ^{Ce}	5	50.0% ^{Aa}	3	30.0% ^{Bd}
September	0	0.0% ^{De}	3	30.0% ^{Bb}	0	0.0% ^{De}	5	50.0% ^{Aa}	2	20.0% ^{Ce}
October	0	0.0% ^{De}	3	30.0% ^{Bb}	5	50.0% ^{Aa}	0	0.0% ^{Dd}	2	20.0% ^{Ce}
November	4	40.0% ^{ABb}	1	10.0% ^{Cd}	0	0.0% ^{De}	0	0.0% ^{Dd}	5	50.0% ^{Ab}
December	2	20.0% ^{Cd}	0	0.0% ^{De}	5	50.0% ^{Aa}	0	0.0% ^{Dd}	3	30.0% ^{Bd}
Total	29	24.2% ^{A}	13	10.8% ^{C}	19	15.8% ^{B}	17	14.2% ^{B}	42	35.0% ^{A}

Ten fecal cultures were examined monthly.

Table 5 Relationship between sex and rate of infestation with GIT helminths in different seasons

	No. of total examined.	Male			Female		
		No. examined	No. Infected	%	No. examined	No. infected	%
Winter	253	150	100	66.7% ^{Bb}	103	73	70.9% ^{Ab}
Spring	145	75	50	66.7% ^{Ab}	70	43	61.4% ^{Bc}
Summer	220	115	70	60.9% ^{Ab}	105	55	52.4% ^{Bc}
Autumn	212	110	107	97.3% ^{Aa}	102	96	94.1% ^{Ba}
Total	830	450	327	72.7% ^{A}	380	267	70.3% ^{A}

Table 6 Relationship between age and rate of infestation with GIT helminths in different season

	6 months-1 year			1-2 year			2-3 year		
	No. examined	No. Infected	%	No. examined	No. Infected	%	No. examined	No. Infected	%
Winter	70	50	71.4% ^{Bd}	103	90	87.4% ^{Ab}	80	32	40.0% ^{Cb}
Spring	30	25	83.3% ^{Ac}	80	50	62.5% ^{Bc}	35	18	51.4% ^{Cb}
Summer	50	45	90.0% ^{Ab}	100	50	50.0% ^{Bc}	70	30	42.9% ^{Cb}
Autumn	60	58	96.7% ^{Aa}	107	105	98.1% ^{Aa}	45	40	88.9% ^{Ba}
Total	210	178	84.8% ^{A}	390	295	75.6% ^{B}	230	120	52.2% ^{C}

4. DISCUSSION

In the present study the prevalence of GIH infestation was 71.4%. This result was compared with other studies in Egypt and it was higher than that reported by Khalafalla et al. (2010) who found that 10.4% of sheep were infected in El-Mahalla, Sultan et al. (2010) who recorded that 51.9% of sheep were infested by helminths in Gharbia province and Sultan et al. (2016), who mentioned that the prevalence of GIH in sheep was 50% in Nile Delta. In other countries, Khan et al. (2010) found that the prevalence of GIH was 44.17% in Pakistan, Negasi et al. (2012) revealed that the overall prevalence of helminthiasis was 56.25% in sheep in Ethiopia and Al-Attar et al. (2015) found that 60% of the examined sheep were found infested with one or more species of helminth parasites in Iraq. On the other hand, this result was lower than that of Abd elnabi et al. (2011) who detected nematode infections in 82.2% of sheep in Sudan, Kelemework et al. (2016) who recorded that 91.4% sheep harbored egg of GIH in Ethiopia, Owusu et al. (2016) who found that 98.2%. of examined sheep were infected with GIH parasites in Ghana and Priyanka et al. (2020) who recorded that 83.24% of examine fecal samples of sheep were positive for helminthic infections in India. The recorded variation in this study may be attributed to the differences in management procedures or may be due to difference in climatic condition among countries. Regarding the seasonal prevalence in the present study revealed that the highest GIH prevalence was observed in autumn (95.75%) followed by winter (67.98%) and spring (64.13%) while the lowest prevalence was recorded in summer (58.81%). This results agreed with Priyanka et al. (2020) who recorded that a significantly higher infection rate was observed in autumn (98.88%) as compared to winter (74.17%), spring (78.88%) and summer (82.72%) season and disagreed with findings reported by Khalafalla et al. (2010) where they observed that the highest rate of infection was in autumn (15.2%) followed by summer (11.1%) and winter (9.4%), while the lowest rate was in spring (5.6%) and Rahman et al. (2017) who found that seasonal variation was observed in rainy (72.44%), winter (56.72%) and summer (61.82%) seasons.

Concerning the prevalence of different helminths eggs in sheep fecal samples, the current study revealed that the highest significant single prevalence was by Trichostrongylus spp. (41.7%) followed by Moneizia spp. (14%), Neoascaris vtillorum spp. and Trichuris spp. (4.6% and 3.7%; respectively), while the lowest significant prevalence was recorded in Avitellina spp. (1.9%). The prevalence of mixed infestation was 34.2% and this result agreed with Abd elnabi et al. (2011) who detected that nematode infections were the commonest, reaching 82.2% of the examined sheep in Sudan, where Haemonchus contortus and Trichostrongylus colubriformis had the highest prevalence 68.9% and 60%, respectively, Kantzoura et al. (2012) who detected that Strongyle-type eggs were found in 3.4%, *Nematodirus* spp. eggs in 1.1%, *Trichuris* spp. eggs in 2.9% of sheep in Greek, Raza et al. (2014) who found that nematode infestations were most prevalent (37.5%) in Pakistan and Kelemework et al. (2016) who recorded that the most prevalent species were Strongylus spp. (45.01%), Nematodirus (11.11%), Trichuris (12.8%) and Moniezia (13.67%) in Ethiopia. On the contrary, this results disagreed with Sultan et al. (2010) in Egypt who recorded that the most prevalent helmithes was Fasciola spp. Paramphistomum cervi, Moneizia expensa, Avitellina centripunctata, Cysticercus tenuicollis, Haemonchus contortus, Parabonema skrjabini and Graphidiops spp Khan et al. (2010) in Pakistan who found that the important helminth species identified were Fasciola gigantica, Fasciola hepatica, Haemonchus contortus, Toxocara vitulorum, Trichostrongylus spp., Oesophagostomum spp., Ostertagia spp., Cooperia spp., Strongyloides spp., Moniezia spp., and Trichuris spp.

After coproculture examination of positive sheep fecal samples, the present study showed that the most significant prevalent larvae were Trichostrongylus spp. (24.2%) followed by Oesophagostomum and Haemonchus spp. (15.8% and 14.2%; respectively), the least predominant larvae were Chabertia ovina (10.8%). Mixed larval infection was recorded in 35% of the examined samples. This result agreed with Atle et al. (2013) who recorded that L3 of Trichostrongylus, Haemonchus and Nematodirus type were the most prevalent ones in the coprocultures from sheep in Norway, Kelemework et al. (2016) who recorded that six genera of nematode were identified including Bunostomum (20.29%), Oesophogostomum (25.64%), Chabertia (23.19%), Haemonchus (28.99%), Cooperia (24.64%), Trichostrongylus (40.33%) in sheep. The majority of sheep had mixed infestation with more than one helminth, Rahman et al. (2017) who found that the prevalence of nematode helminths was Haemonchus spp. (31.22%), Trichuris spp. (1.17%), Oesophagostomum spp. (10.80%), Strongyloides spp. (4.93%), Trichostrongylus spp. (2.35%), Bunostomum spp. (1.64%) and Priyanka et al., (2020) who recorded that Coproculture studies revealed that *Haemonchus contortus* was predominant parasite during all the seasons (92%), followed by *Strongyloides* spp. (4%), *Trichostrongylus* spp (3%). and *Oesophagostomum* spp. (2%).

The current study showed that there is no significant difference in GIH prevalence between males and females (72.66 % and 70.26%; respectively), In this concern, this result disagreed with that of Raza et al. (2014) who found that males were more infested than females (73.6%, 79.5%; respectively). Conversely, the present result disagreed with that of Khan et al. (2010) who record a higher prevalence in females than males and Fayisa et al. (2020) who revealed that female sheep were found with a higher prevalence of

helminths infection rate than male (48.98% and 61.60%, respectively)

The current study showed that the highest prevalence of infestation was recorded in lambs at the age of 6 months-one year (84.76%) followed by sheep 1-2 years (75.64%) while the lowest infestation was recorded in sheep 2-3 years (52.17%).This result agreed with Raza et al. (2014) who found that helminths infection were prevalent in young (79.3%) than adult animals (73.8%), Al-Attar et al. (2015) who revealed that the prevalence of helminths was higher in lamb aged≤1 year (69.57%), than adult aged > 2 years (61.40%) and young sheep aged >1-2 year (43.48%). Unfortunately, the current result disagreed with that of Rahman et al. (2017) who found that the infection was significantly higher (65.11%) in adult than in young (58.09%). This difference may be attributed to the fact of difference in sheep breed, variation in the climatic condition of the study areas and also the methods of study.

5. CONCLUSION

It was concluded that the total prevalence of gastrointestinal helminths among examined sheep was 71.44%, the highest seasonal prevalence was significantly ($P<0.05$) recorded in autumn (95.75%), the total prevalence of single infection was (50%). The highest significant single prevalence ($P<0.05$) was recorded by Trichostrongylus spp. (41.7%), the total prevalence of mixed infestation with different helminths species was 34.2%. Copro-culture examination of positive feces revealed that Trichostrongylus spp. and Chabertia ovina were the most and least prevalent larvae (24.2%, 10.8%; respectively). There was no significant effect of sex on the prevalence. Sheep at the age of 6 months-one year expressed a high prevalence (84.8%). In conclusion, it was noted that GIH are endemic at high levels among sheep in the study area and need great effort to control these parasites.

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