



# The Prevalence of Trichostrongyle Infection among Sheep in Saudi Arabia and Association Non-Modified Risk Factors

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**Abstract** | The present study was performed in Dammam city in the Kingdom of Saudi Arabia within the period from July 2019 to June 2020 to associate the epidemiological prevalence of trichostrongyle infection in sheep in different age groups, sex and seasons. A total of 400 sheep were examined randomly from different private farms, and faecal examination through direct smear and flotation techniques were done to determine the presence of the eggs. Out of these, 104 animals were infected with strongyle eggs with (26%) prevalence. Sex, season, and age were the factors that affect the prevalence of trichostrongyle infection in this study. Data analysis reported that there was a significant effect for the season and sex on the trichostrongyle infection level; the highest nematode infection level was observed in the cold months (December-April) with a prevalence of 36.44% and lowest prevalence (15.17%) in hot months (May-September) ( $P < 0.05$ ). Females were found to be more prone to infection (31.48%) than males (14.61%) ( $P < 0.05$ ). Young sheep less than 6 months old were slightly less infected (25.62%) than old animals (6-36 months) (26.25%), but the age did not affect significantly the nematodes prevalence as  $P > 0.05$ . The current study demonstrated that the trichostrongyle prevalence was low in such a dry weather area, with sustainable control programs. Risk factors of age, season, and sex were considered as factors influencing nematodes prevalence. These findings should contribute to advising appropriate control programs.

**Keywords** | Sheep, Trichostrongyle egg, Prevalence, Season, Sex, Age

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## INTRODUCTION

Sheep and goats represent the majority of livestock in Saudi Arabia, as they can survive under the climatic conditions prevailing in this country. Gastrointestinal parasites are a big problem for small ruminants health in livestock farming in developing countries (Kumba et al., 2003; Mulcahy et al., 2004). Family *Trichostrongylidae* is one of the most serious gastrointestinal nematodes (GIN) infecting small ruminants. It includes many genera:

*Haemonchus contortus*, *Ostertagia leptospicularis*, *Cooperia curticei*, *Teladorsagia circumcincta*, *Trichostrongylus axei*, and *Trichostrongylus colubriformis*. *Haemonchus contortus* is considered the most pathogenic blood-sucking parasite in this family followed by *Teladorsagia* spp and *Ostertagia* spp (Zarlenga et al., 2016). The egg of this family is similar in shape except *Nematodirus* spp. egg and cannot be differentiated under the light microscope (Zajac and Conboy, 2012). To differentiate the genera of these nematodes, faecal culture and identification of L3 are required.

GIN infection negatively affects the small ruminant production directly, as it causes weight loss, low-quality fleece production, mortality, premature slaughter, and affect meat quality (Maichomo et al., 2004). Some risk factors, such as (age, sex, immunity) and the environmental such as (season, nutrition, management) are played crucial role in the prevalence of nematodes infection in animals (Odoi et al., 2007). Although the economic importance of GIN nematodes in small ruminants, few researches were conducted in this field in Saudi Arabia. The present study was designed to study the prevalence of trichostrongyle nematodes in sheep in Dammam city, the Kingdom of Saudi Arabia, and to estimate the effect of season, age, and sex on trichostrongyle prevalence.

## MATERIALS AND METHODS

### STUDY DESIGN

This study was performed between July 2019 and June 2020 in Dammam city in the Kingdom of Saudi Arabia 26.238256 N and 50.198461 E. It was a cross section study. The sample size is A total number of 400 faecal samples were collected randomly from naturally infected sheep which grazed on some private farms, the animals had different sex and different age groups which ranged from 0-36 months; they were categorized according to their age into two groups (the 1<sup>st</sup> group less than 6 months and the 2<sup>nd</sup> group 6- 36 months). Sampling and examination were conducted in different seasons which were categorized into 2 groups; the hot season (May-September) and the cold season (December-April).

### FAECAL ANALYSIS AND EGG COUNT

**Direct Smear:** Fresh faecal samples were collected from the rectum in a numbered plastic cup labeled with sex, age and date of collection. Qualitative analysis using direct smear was performed; a small portion from each sample was transferred to a glass slide and mixed with a drop of normal saline, and examined under a light microscope with 10 magnification lens to detect trichostrongyle eggs.

**Concentration Flotation Technique:** A mixture of 3 grams of faeces and 15 ml saturated sugar solution was filtrated through a t-sieve, then was transferred to a centrifuge tube and was centrifuged at 3000 rpm for 5 minutes. One drop from the supernatant was transferred to a microscope slide and was examined under 10 magnification lens (Cox and Todd, 1962) method.

### STATISTICAL ANALYSIS

All the data was analysed by SPSS (version 22, IBM Corp., Armonk, NY). Pearson Chi-square test was used to measure the association between season, sex, and age and the nematodes prevalence. P-value <0.05 was considered as

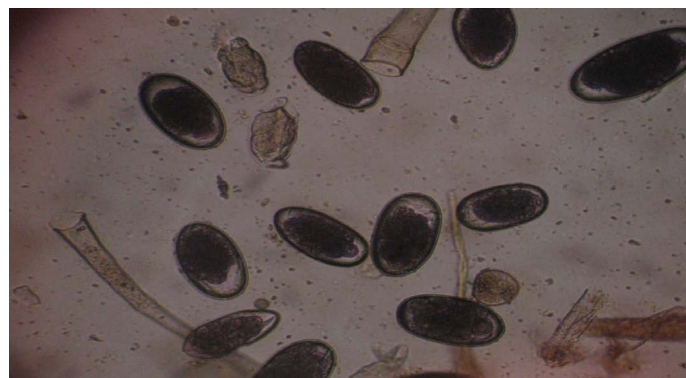
statistically significant.

## RESULTS AND DISCUSSION

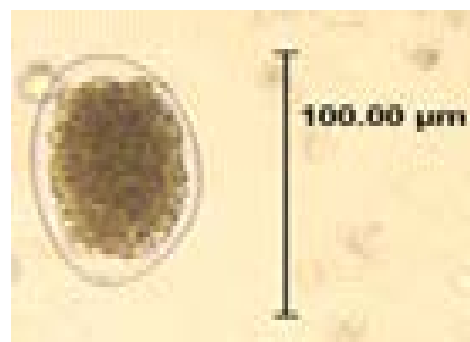
### PARASITE PREVALENCE

Through microscopic examination, out of these 400 animals, 104 were infected with trichostrongyle species with a prevalence of (26%). The eggs were identified according to their main morphological features (Figure 1), except for the large characteristic *Nematodirus* spp egg: a small ellipsoid shape, with thin wall, oval, elongated, pointed at one or both ends, colorless and containing undifferentiated cell, as shown in Figure 1. Trichostrongylus eggs must be differentiated from hookworm eggs, which are smaller and do not have pointed ends and the worm size is 40-60 um versus Trichostrongyle eggs is 85-115 um as shown in Figure 2.

These findings of the low prevalence of nematode infections are compatible with the climatic conditions of this hot dry area, along with, the regular use of Anthelmintic drugs there. These results don't agree with a study conducted in Jeddah, the Kingdom of Saudi Arabia by (El-Azazy, 1995) who recorded a higher infection rate (47.9%) in sheep.



**Figure 1:** Trichostrongyle egg by flotation technique under a light microscope by 10 magnification length



**Figure 2:** Trichostrongyle egg measurements

### EFFECT OF SEX ON TRICHOSTRONGYLID PREVALENCE

The females had a higher infection rate (31.48%) than males (14.61%). Statistically, there was a significant associ

**Table 1:** Effect of sex, age, season on trichostrongyle prevalence in sheep

Factors	Categories	Examined animals	Infected animals	Prevalence %	X2 value	P value
Sex	Males	130	19	14.6	12.974	<0.001
	Females	270	85	31.5		
Age	Young <6 months	160	41	25.6	0.0195	0.889
	Old 6-36 months	240	63	26.3		
Season	Hot (May-October)	145	22	15.2	13.859	<0.001
	Cold (November- April)	255	82	32.1		

ation between sex and trichostrongylid prevalence as P-value <0.005 as indicated in Table 1. This higher prevalence rate of infection in females may be attributed to several stress factors which depress the immune system such as pregnancy, parturition, and lactation (Urguhart et al., 1996). The current results agree with a lot of other previous studies: (Elseadawy et al., 2018) recorded a higher infection rate in females (36% in sheep and 20.27% in goats) than males (8.57% in sheep and 4.87% in goats). (Khan et al., 2010) recorded 28.67% for females and 19.81% for males in sheep; (Kuchai et al., 2011) recorded 76.28% females and 63.05% males. (Adediran, Adebisi et al., 2014) recorded 94.1% in females and 87.8% in males and (Jegade et al., 2015) recorded (26.8% and 10.7%) in females and males respectively. However, these results did not agree with another study that was conducted by (Sallam et al., 2017) who detected a higher prevalence infection rate in males 60% than in females 30%, as well as with (Tariq et al., 2008) who recorded 70.2% for males and 68.7% for females.

### EFFECT OF AGE ON TRICHOSTRONGYLID PREVALENCE

Age observation revealed a little higher nematodes prevalence (26.25%) in old animals (6-36 months) than in young animals (25.62%) as shown in Table 1. The low prevalence rate in young sheep below six months may be related to the transfer of maternal immunity to lambs. Statistically, there was no association between the age groups and the nematodes prevalence ( $P>0.05$ ) This outcome in sheep agree with another study (Shankute et al., 2013) stated that age has no significant effect ( $P>0.05$ ) on the trichostrongyle prevalence rate. On the other hand, our results not agree with many other studies stating that the young animals had higher infection rate; (Khan et al., 2010) recorded (27.04% in young and 15.67%, in old ones respectively), (Zeryehun, 2012) recorded 64.52% in young and 56.29% in adults and (Elseadawy et al., 2018) recorded 78.35% in young, 15.22% in adults.

### EFFECT OF SEASON ON TRICHOSTRONGYLID PREVALENCE

The present study reported a higher trichostrongylid prevalence in cold months (36%) than in hot months (15.17%), as chi-square output showed that there is a significant as-

sociation between season and the parasite prevalence as  $P<0.005$  (Table 1). This result is expected in a desert country like Saudi Arabia, where a hot dry climate prevails. The higher nematodes prevalence in the winter season because it is the ideal time there for grazing and dissemination of the eggs and subsequently the infection, the temperature there ranges between 14 and 23°C, with little rains. The summer is extremely hot (temperatures reached up to 45 °C), dry and rainless. Our result is consistent with (Anene et al., 1994; Zeryehun, 2012) who stated that the infection rate is higher in wet seasons than in dry seasons, and their results were confirmed by (Hassanen, 2014) who recorded the highest GIN infection rate in the winter. However another study in Ethiopia recorded higher infection level in dry seasons (Tesfaheywet and Murga, 2019) and this could be due to the poor immunity and lack of grass in the dry seasons (Kumba et al., 2003).

## CONCLUSION

The present study reported a low trichostrongyle prevalence in sheep in Dammam city. Sex and season were indicated as important factors which significantly influence the risk of GIT nematode infection in sheep there. Age had an insignificant effect on the nematodes prevalence. These findings should be taken into considerations while designing control programs and prophylactic measures for GIT nematodes infection in sheep in such climatic area, as well as in similar regions which has the same climate.

## CONFLICT OF INTEREST

All included authors have no conflicts of interest to declare

## ETHICAL STATEMENT

This research did not include any experimentation on animals and all collection procedures were performed for the sheep benefit and standard diagnostic purposes.

## ACKNOWLEDGMENTS

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## NOVELTY STATEMENT

As sheep and goats represent most livestock in Saudi Arabia. Gastrointestinal parasites are a major problem for small ruminants health and production, the present study investigate the prevalence of trichostrongyle nematodes in sheep in in such a dry weather area in the Kingdom of Saudi Arabia, and estimate the effect of season, age, and sex on trichostrongyle prevalence.

## AUTHORS CONTRIBUTION

All the authors contribute in the study design, data processing and analysis and writing.

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