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Parasite Prevalence in Slaughtered Animals in Relation to Host Origin and Host Age

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ABSTRACT

Background: The productivity of livestock production has been greatly impacted by parasitic diseases. The infection prevalence of parasites in native and imported slaughtered animals has not received much attention, despite the fact that Saudi Arabia has data on animal parasites. This study aimed to determine the infection prevalence of parasites in slaughtered animals in relation to host origin and host age.

Methods: This investigation was conducted at Al Makhwah area in southwestern Saudi Arabia for six months from September 2021 to February 2022. The examined animals were 1208 in total, including goats (504), sheep (440) and cattle (264). All the animals examined were slaughtered at official abattoirs. The collected parasites were preserved, processed and identified.

Result: Out of 1208 examined, 72 were infected (5.96%). The parasite community consisted of six species, *Dicrocoelium dendriticum*, *Fasciola hepatica, F. giagantica, Monezia expansa*, *Echinococcus granulosus* (Hydatiid cyst) and *Haemonchus contortus*. Hydatidosis was a more prevalent parasitic disease. The infection prevalence of hydatidosis in the examined animals was high in cattle (4.85%) while were 3.76 and 4.77% in goats and sheep respectively. Significant differences in prevalence per host age in goats, sheep and cattle were found. The prevalence of parasites in imported animals was higher (16.67, 17.5 and 11.36% in cattle, sheep and goats respectively) as compared to that in native ones (5.42, 6.5 and 3.69% in cattle, sheep and goats respectively). Based on our findings, Hydatidosis was identified as the most prevalent parasitic disease. Imported animals had a higher parasitic infection compared to local animals. It is essential to take necessary measures to prevent the transmission of Hydatidosis and improper organ condemnation from abattoirs. We recommend conducting further research to identify the reasons why imported animals are more likely to become infected than local animals.

Key words: Host age, Imported, Native, Parasitic infection, Saudi Arabia, Slaughtered animals.

INTRODUCTION

The parasitic infection has significant public health implications and can greatly affect the economies of countries. Parasitic infections cause significant economic losses to the livestock industry and agricultural communities. Infected animals often die, experience weight loss, have reduced milk production and may have organs that are unsuitable for human consumption. These impacts have been documented in previous studies (Suarez and Busetti, 1995; Murshed *et al*., 2022). Liver flukes and *Echinococcus granulosus* are common parasites affecting livestock. Domesticated ruminants, such as cattle and sheep, are particularly vulnerable to *Fasciola hepatica* (Kaplan, 2001) and *F. gigantica* (Mungube *et al*., 2006; Gabriël *et al*., 2022), which are well-known parasites in some countries. These parasites can cause significant economic losses in the livestock industry. Young cattle with acute liver disease and older cattle with chronic liver disease exhibit clinical signs of digestive inefficiency (Doyle, 2003; Ibrahim, 2010; Gabriël *et al*., 2022).

In Saudi Arabia, hydatidosis is a prevalent liver parasite in animals and humans and this represents a significant public health concern (Ibrahim, 2010). Previous studies have been conducted in certain regions of the country regarding the prevalence of parasites infecting cattle, sheep, goats and camels (Ibrahim *et al*., 2008; Ibrahim, 2010; Toulah *et al.,* 2012; Toulah *et al.,* 2017; Murshed *et al.,* 2022; Al-Ghamdi *et al*., 2023). The productivity of livestock production has been greatly impacted by parasitic diseases. The infection prevalence of parasites in native and imported slaughtered animals has not received much attention,

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despite the fact that Saudi Arabia has data on animal parasites. This study aimed to determine the infection prevalence of parasites in slaughtered animals in relation to host origin and host age.

MATERIALS AND METHODS

The current investigation was conducted in Al Mekhwah Province, located in the southwestern region of Saudi Arabia (19°46′45″N, 41°26′8″E). The study area is located at an altitude of zero meters above sea level. Al Makhwah has a subtropical desert climate. The annual average temperature in the district is 26.66°C, which is 0.35% lower than the average temperature in Saudi Arabia. Al Makhwah receives an average of 31.38 millimeters of precipitation annually, with 71.05 rainy days (19.47% of the year).

A total of 1208 examined animals (264 cattle, 440 sheep and 504 goats) were examined for parasitic infection during the six months from September 2021 to February 2022. All the animals examined were slaughtered at official abattoirs in Al Makhwah City, Saudi Arabia. The distribution of the sampled host population by host origin is presented in Table (1). The collected parasites were preserved, processed and identified (Levine, 1978). The parasite specimens were identified following of Soulsby (1982) and Bowman (2019).

The ecological terminology used in this work was in accordance with the description provided by Bush *et al.* (1997). The chi-square test (χ^2) was used to examine the difference in parasite prevalence among host age and host origin. All statistical tests were conducted using SPSS 22.00 (USA).

RESULTS AND DISCUSION

The community of parasites included six species: three trematodes (*Dicrocoelium dendriticum, Fasciola hepatica* and *Fasciola giagantica*), two cestodes (*Monezia expansa* and *Echinococcus granulosus*) and one nematode (*Haemonchus contortus*). The infection prevalence among goats, sheep and cattle was 6.34, 7.5 and 4.56% respectively (Table 2). These species match those documented by Ibrahim *et al.* (2008) in southwestern Saudi Arabia's Al-Baha region.

E. granulosus (hydatid cyst) had the highest prevalence in cattle (4.85%), sheep (4.77%) and goats (3.76%) while *H. contortus* had the lowest prevalence (Table 2). These findings are consistent with previous studies conducted by Ibrahim *et al.* (2008) and Toulah *et al.* (2017). The high rate of infection of hydatidosis can be explained by the close relationship between dogs and animal herds, especially those of sheep and goats. The close relationship between dogs, sheep and humans makes it more likely for the parasite's life cycle to be completed. The high infection rate may be attributed to factors connected to the social and economic conditions of the population, such as the extensive use of traditional methods in raising small ruminants (extensive or semi-extensive grazing), the existence of a large number of sheepdogs that are drawn to the sheep farming sites and the illegal slaughter of animals (Ibrahim, 2010).

There was variation in the overall prevalence per age of the host among the animals examined. Old animals (over 1 year old) have higher prevalence rates than young ones in cattle, sheep and goats (Fig 1). The study revealed that there is a strong correlation between the rate of infection and the age of the host in cattle, sheep and goats. Significant differences were found in overall prevalence in cattle (χ^2= 32.67, df= 1, P<0.001), sheep (χ^2= 82.38, df= 1, P<0.001) and goats (χ^2= 47.72, df= 1, P<0.001). The prevalence of parasite infection is highest in older age. Study findings are consistent with El-Ghareeb *et al.* (2017) and Murshed *et al.* (2022). Murshed *et al.* (2022) found a significant positive association between age class and *D. dendriticum* infection. Age differences can lead to varying levels of exposure to

Table 1: The structure of the sampled host population by host origin.

Examined animal	Native	Imported	Total
Goat	460	44	504
Sheep	400	40	440
Cattle	240	24	264
Total	1100	108	1208

Table 2: Prevalence of parasite species in examined slaughtered animals.

Parasites	Parasite habitat	Goats (*n*=504)	Sheep (*n*=440)	Cattle (*n*=268)
Trematoda				
Dicrocoelium dendriticum	liver	0	2.27 (10/440)	2.23 (6/268)
Fasciola hepatica	Liver	0	0.68 (3/440)	0
Fasciola giagantica	Liver	0	3.18 (14/440)	2.98 (8/268)
Cestoda				
Monezia expansa	Intestine	1.58 (8/504)	3.18 (14/440)	0
Echinococcus granulosus (Hydatid cysts)	Liver, mesenteries and lungs	3.76 (19/504)	4.77 (21/440)	4.85 (13/268)
Nematoda				
Haemonchus contortus	Abomasum and intestine	0	0.23 (1/440)	1.12 (3/268)
Total Infected animals		23	33	17
Overall prevalence (%)		4.56%	7.5%	6.34%

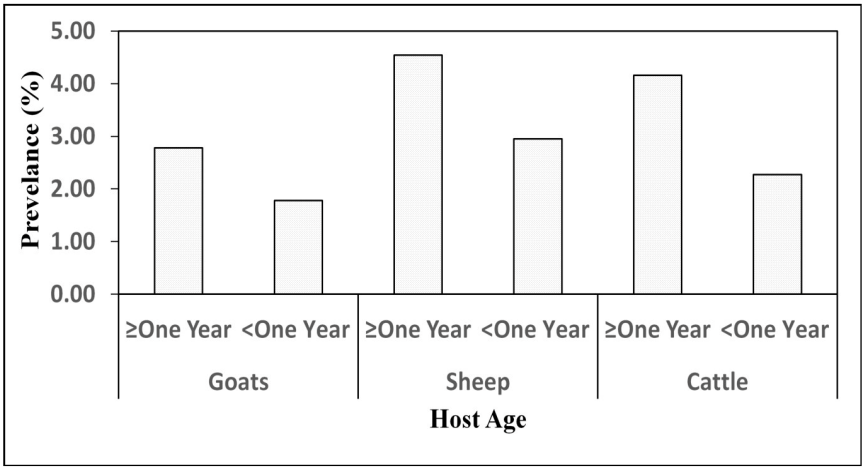

Fig 1: Overall prevalence of all parasite combined in different types of examined animals per host age.

Table 3: Prevalence of parasite species in locale and imported slaughtered animals.

Parasites	Parasite habitat	Goats (*n*=504)		Sheep (*n*=440)		Cattle (*n*=268)	
		Native (n=460)	Imported (n=44)	Native (n=400)	Imported (n=40)	Native (n=240)	Imported (n=24)
Trematoda							
D. dendriticum	liver	0	0	2 % (8/400)	5 (2/40)	1.61 (4/240)	8.33 (2/24)
F. hepatica	Liver	0	0	0.5 (2/400)	2.5 (1/40)	0	0
F. giagantica	Liver	0	0	3.5 (14/400)	0	2.5 (6/240)	8.33 (2/24)
Cestoda							
M. expansa	Intestine	1.09 (5/460)	6.81 (3/44)	2.75 (11/400)	7.5 (3/40)	0	0
E. granulosus (Hydatid cysts)	Liver, mesenteries and lungs	3.26 (15/460)	9.09 (4/44)	4.25 (17/400)	10 (4/40)	4.16 (10/240)	12.5 (3/24)
Nematoda							
H. contortus	Abomasum and intestine	0	0	0	2.5 (1/40)	0.83 (2/240)	4.16 (1/24)
Total Infected animals	17	5	26	7	13	4	
Total uninfected	443	39	374	33	127	20	
Overall prevalence	3.69 (17/460)	11.36 (5/44)	6.5 (26/400)	17.5 (7/40)	5.42 (13/240)	16.67 (4/24)	

infection, as older animals may have encountered more infectious stages. Moreover, the parasite's development can be influenced by the host in which it resides. For instance, a larger host can provide more space and energy resources, which can facilitate parasite development.

The prevalence of infection differed significantly between native and imported slaughtered animals (*P<0.001*). The infection rate in native animals was low (infection rates were 5.42, 6.5 and 3.69% in cattle, sheep and goats respectively) as compared to imported ones (infection rates were 11.36, 17.5 and 16.67 % in cattle, sheep and goats respectively) (Table 3). The overall prevalence of the parasite in imported slaughtered animals was significantly higher than natives' ones in cattle (χ^2 = 78.27, df= 1, P<0.001), sheep (χ^2= 72.43, df= 1, P<0.001) and goats (χ^2= 37.23, df= 1, P<0.001). The highest prevalence rate was found in *D. dendriticum*, *F. hepatica, M. expansa E. granulosus* and *H. contortus* in imported slaughtered animals (Table 3). Toulah *et al.* (2017) and Murshed *et al.* (2022) reported similar findings. Nabavi *et al.* (2014) found that imported cattle from Pakistan had a significantly higher prevalence of Hydatidosis (15.1%) compared to native cattle from Iran (5.3%). It is recommended that the slaughtering of imported livestock should take place in industrial centers in order to prevent a potential increase in canine echinococcosis, which can lead to hydatidosis in humans and farm animals. On the other hand, El-Ghareeb *et al.* (2017) found a low infection rate of imported animals. The higher prevalence of the parasite in imported animals may be attributed to the difference in the feeding system of animals in Saudi Arabia. Most native demotic animals in Saudi Arabia are fed manually and not in the pasture.

CONCLUSION

Based on our findings, Hydatidosis was identified as the most prevalent parasitic disease. Imported animals had

a higher parasitic infection compared to local animals. It is essential to take necessary measures to prevent the transmission of Hydatidosis and improper organ condemnation from abattoirs. We recommend conducting further research to identify the reasons why imported animals are more likely to become infected than local animals.

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Statements and declarations

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Author contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Mohamed M. Ibrahim, Ali Al-Ghamdi, Kareem Morsy and Eltahir Idris. The first draft of the manuscript was written by Mohamed Mousa Ibrahim and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Data availability

Our manuscript has no associated data.

Ethics approval

No approval of research ethics committees was required to accomplish the goals of this study.

Conflict of interest

The authors have no relevant financial or non-financial interests to disclose.

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