Original Article

Epidemiological Survey of Bovine Thelaziosis in Southeastern of Iran

Javad KHEDRI 1, Mohammad Hossein RADFAR 1, *Hassan BORJI 2, Mohammad AZIZAZADEH 3

1. Dept. of Pathobiology, School of Veterinary Medicine, Babonar University of Kerman, Kerman, Iran
2. Dept. of Pathobiology, School of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran
3. Dept. of Clinical Sciences, School of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran

Received 17 Sep 2015
Accepted 10 Feb 2016

Abstract

Background: This study aimed at investigating the prevalence and risk factors of bovine thelaziosis, performed in the southeast of Iran, an endemic area for Iranian Sistani cattle.

Methods: Between September 2012 to October 2014, 1924 cattle, Sistani breed (n= 1235) and Brahman breed (n=689) of all sex and age groups collected from Sistan and Baluchestan Province were examined using visual observation of the eyes by flushing the conjunctival sac and lachrymal duct with sterile saline solution.

Results: The overall prevalence for thelaziosis was 50 of 1924 cows (2.6%; 95% CI: 1.9-3.3%), with significant higher prevalence of infection in Sistani breed than in Brahman breed (3.15% vs 1.59%). Sixty adult worms (84.5% of females and 15.5% of males) were collected from the conjunctiva of the infected cattle: Thelazia gulosa (50/60, 83.3%) was the most represented species followed by Thelazia rhodesi (10/60, 16.7%). The number of worms collected per cow ranged from one to seven (average ± standard deviation: 2.08 ± 1.49). Worms were gathered from cows throughout all months of the year. The difference in the seasonal variations of prevalence and the intensity of infection were significant, however, no significant correlation between prevalence, sex and age of cattle was noted.

Conclusion: Bovine thelaziosis needs special attention by veterinarians in the differential diagnosis of ocular manifestations and considering its impact on cattle production.
Introduction

Thelazia nematodes (Spirurida, Thelaziidae) which affect the eyes of numerous domestic animals and humans, have a wide geographical distribution throughout the world (1, 2). The adult nematode lives in the eyes and associated tissues, including under the eyelids, nictitating membranes and lacrimal ducts and in the conjunctiva. Transmission of eye worms occurs by means of secretophagous non-biting flies, which feed on animal lachrymal secretions and become infected with the first stage larvae (L1). Larval development takes place in different parts of the vector depending on the Thelazia species, and infective stages are present in 18–25 d. Development to the adult stage takes place without migration in the conjunctival sac of the final host within 35 d. Disease caused by Thelazia spp. is characterized by mild (e. g., conjunctivitis, epiphora, and ocular discharge) to severe (e. g., keratitis, and corneal ulcers) ocular disease (2). Diagnosis is made by the detection of eggs or first-stage larvae in lacrimal secretions or by finding the adult worms in the conjunctival sac. Due to the localization of the nematode, thelaziosis can be treated topically by direct using of drugs into the eyes, and removal of the adult parasites with fine forceps, using local anesthesia.

Bovine thelaziosis has been studied in Asia, South Africa, Europe and North America, (3–8). In Iran, since the 1951’s bovine thelaziosis was represented by only T. rhodesi (9). Recently, two more species including T. gulosa, and T. skrjabini were reported from cattle (10). After this report, an investigation was undertaken to update the overall prevalence of thelaziosis in native cattle in Sistan-Baluchestan Province in the southeastern of Iran.

The objective of current study was to determine the prevalence and intensity of bovine thelaziosis in the study area and to assess, some of the epidemiological risk factors that might contribute for infection.

Materials and Methods

This study was carried in Sistan and Baluchestan Province, located in the southeastern part of Iran. This province lies on the border with both Afghanistan and Pakistan that is located near Lake Hamun and the region is wetted by the Hirmand River.

During Sep 2012 to Oct 2014, seasonal systematic random sampling was carried out and based on previous reports on the prevalence of infection (P=2%), the minimum sample size was determined to be 753, although for preventing attrition, more samples (1924) were taken (497 in spring, 515 in summer, 541 in autumn and 371 in winter). Overall, 1924 cattle, Sistani breed (n= 1235) and Brahman breed (n=689) of all sex and age groups were examined using visual observation of the eyes by flushing the conjunctival sac and lacrimal duct with sterile saline solution. Numbers of worms found in each cattle were recorded separately, and the species were determined according to the morphological characteristics (11).

In order to evaluate the role of different risk factors for infection, age, season and sex of inspection of these cows were recorded in a sheet. Association of independent variables (sex, age, season and breed) and infection was evaluated using Chi-Square and Fischer exact test of SPSS software version 16 (Chicago, IL, USA) and (P<. 0. 05) was considered as significant.

Results

The overall prevalence for thelaziosis was 50 of 1924 cows (2. 6%; 95% CI: 1. 9-3. 3%), with significant higher prevalence of infection in Sistani breed than in Brahman breed (3. 15% vs. 1. 59%). Sixty adult worms (84. 5% of females and 15. 5% of males) were collected from the conjunctiva of the infected cattle: T.
gulosa (50/60, 83.3%) was the most represented species followed by T. rhodesi (10/60, 16.7%). The number of worms collected per cow ranged from one to seven (average ± standard deviation: 2.08 ± 1.49). Worms were gathered from cows throughout all months of the year.

The results of prevalence according to breeds, age groups, gender and season are summarized in Table 1. There was a significant seasonal variation between the prevalence of infection and season, however, no significant correlation between prevalence, intensity of infection, sex and age of cattle was noted.

Table 1: Prevalence and intensity of infection with Thelazia spp. in Iranian Sistani and Brahman cattle with respect to sex, season and age

| Variables | Sistani breed | Brahman breed |
|-----------|---------------|---------------|
|           | No. of tested animal | No. of positive (%) | Intensity ±SD | P-value | No. of tested animal | No. of positive (%) | Intensity ±SD | P-value |
| Sex       |               |               |               |         |               |               |               |         |
| Male      | 875           | 32 (3.65)     | 3±1           | 0.12    | 465           | 8 (1.72)       | 3±1           | 0.71    |
| Female    | 360           | 7 (1.94)      | 5±2           |         | 224           | 3 (1.33)       | 2±1           |         |
| Season    |               |               |               |         |               |               |               |         |
| Spring    | 314           | 10 (3.18)     | 2±1           | <0.001  | 183           | 2 (1.09)       | 2±1           | <0.001  |
| Summer    | 346           | 22 (6.35)     | 5±2           |         | 169           | 8 (4.73)       | 3±2           |         |
| Autumn    | 304           | 5 (1.64)      | 1±1           |         | 237           | 1 (0.42)       | 1±1           |         |
| Winter    | 271           | 2 (0.73)      | 1±1           |         | 100           | 0 (0)          | 0            |         |
| Age (yr)  |               |               |               |         |               |               |               |         |
| <2        | 361           | 18 (4.98)     | 5±2           | 3±1     | 0.12          | 211           | 6 (2.84)     | 3±1     | 0.47    |
| 2-3       | 323           | 7 (2.16)      | 2±1           |         | 181           | 2 (1.1)        | 1±1           |         |
| 3-4       | 260           | 6 (2.3)       | 2±1           |         | 120           | 1 (0.83)       | 2±2           |         |
| >4        | 294           | 8 (2.72)      | 2±1           |         | 177           | 4 (2.25)       | 1±1           |         |
| Total     | 1235          | 39 (3.15)     |               |         | 689           | 11 (1.59)      |               |         |

Discussion

The epidemiology of Thelazia spp. is mainly influenced by the presence and seasonality of its vectors and the susceptibility of its definitive hosts. Understanding the epidemiology of infection by Thelazia spp. in cattle is a need for reducing the risk of infection, especially by improving their management to avoid exposure to the eye worms.

The present study indicated that besides T. rhodesi, T. gulosa is very common in cattle in the southeastern of Iran. Accordingly, the infection rate only with T. rhodesi was 3.5% in examined cattle in Iran (9). Result of this study on the presence of T. gulosa in native cattle in the southeastern of Iran suggests that this species has a more extensive geographical distribution than previously thought. We may hypothesized that this lack of information on the presence of T. gulosa in other regions of country may be due to their sheltered location (12) which probably makes its detection difficult. Moreover, the high frequency of T. gulosa infection in this region may account partly by high prevalence of the vector of this nematodes.

T. rhodesi is particularly common in the Old World and have been reported from Japan, USA, Canada, UK, Italy, and Zambia, whereas, T. gulosa is mainly distributed in the New World and has been reported in the northern USA, the Canadian Provinces, Asia, Australia and Europe (3, 4,5,7,8,13,15,16). The climate
of the countries in which *T. gulosa* and *T. rhodesi* has been reported varies from tropical and subtropical in the Far East, to temperate in the Russian Federation.

The infection rate in general is lower than what reported from Northwest Ethiopia as 36.83% (15), Zambia 26.6% (13), Philippines 23% (16), Massachusetts 12.2% (5), Canada 9.3% (14), British 41.9% (4) and Italy (7.2% (7). This disagreement might be attributed due to differences in climate conditions, ecological and management systems.

The result of current study revealed that infection rate in <2 yr old both breed is greater than others which were not significant. In contrast, the high prevalence and intensity of infection in cattle more than 2 yr of age and less than 10 have been reported by others (14). High prevalence of *Thelazia* infection of ages less than 2 yr old that is in agreement with Krafsur and Church (6) and Adamu et al. (15)

Our result showed that the prevalence of bovine thelaziosis was not significantly associated with animal sex. Finding non-significant difference in prevalence by sex is in agreement with other investigators (9, 13, 16).

Despite the presence of adult parasites throughout the year, the prevalence in both breed was highest in summer, significantly. “As the first stage larva of *Thelazia* is very short-lived in the lachrymal secretions, only surviving a few hours, and transmission depends upon the continuous presence of the vectors. For this reason, thelaziosis has a seasonal occurrence according to the seasonality of the intermediate hosts” (17). Moreover, the disappearance of adults in eye suggested that there might be a phenomenon occurring similar to the self-cure phenomenon of gastrointestinal *Strongyles* in sheep (4).

Additionally, when the results for Brahman breed were compared with those of Sistani breed, the frequencies of thelaziosis in Sistani breed were higher than Brahman breed, which was significant.

For controlling eye worm infection, molecular epidemiological survey of *Thelazia* spp., in definitive hosts is valuable, particularly as some species can cross-infect the same animals and different species have different susceptibilities to anthelminthic drugs. Moreover, molecular identification of larval eye worms in their vectors will also be useful for studying the epidemiology of *Thelazia*, its prevalence in flies and recognition of the intermediate hosts.

**Conclusion**

Bovine thelaziosis needs special attention by veterinarians in the differential diagnosis of ocular manifestations and considering its impact on cattle production.

**Acknowledgments**

This study was supported by Shahid Bahonar University of Kerman and Ferdowsi University of Mashhad. The authors declare that there is no conflict of interest.

**References**

1. Anderson RC. Nematode parasites of vertebrates: their development and transmission. 2nd ed. CABI. 2000; Wallingford, UK.
2. Soulsby EJL. Helminths, arthropods and protozoa of domesticated animals. 7th ed. Bailliere Tindall. 1982; London, UK.
3. Okoshi S, Kitano N. Studies on thelaziasis of cattle. I. *Thelazia skrjabini* Erschow, 1928 found in Japan. Nihon Juigaku Zasshi. 1966; 28: 11–15.
4. Arbucket JB, Khalil LF. A survey of thelazia worms in the eyelids of British cattle. Vet Rec. 1978; 102(10): 207-210.
5. Geden CJ, Stoffolano JG. Bovine thelaziasis in Massachusetts. Cornell Vet. 1980; 70(4): 344-59.
6. Krafsur ES, Church CJ. Bovine thelaziasis in Iowa. J Parasitol. 1985; 71(3):279-86.
7. Giangaspero A, Otranto D, Vovlas N, Puccini V. *Thelazia gulosa* Railliet & Henry, 1910 and *T. skrjabini* Erschow, 1928 infection in southern Europe (Italy). Parasite. 2000; 7(4):327-9.

Available at: [http://ijpa.tums.ac.ir](http://ijpa.tums.ac.ir)
8. Otranto D, Traversa D. *Thelazia* eyeworm: an original endo- and ecto-parasitic nematode. Trends Parasitol. 2005; 21(1): 1-4.

9. Ebadi A. A survey on *Thelazia* spp. in cattle in Tehran, Iran. DVM thesis No. 428, College of Veterinary Medicine, Tehran University, Tehran, Iran, 1951.

10. Naem S. Morphological differentiation among three *Thelazia* species (Nematoda: Thelaziidae) by scanning electron microscopy. Parasitol Res. 2007; 101:145–151.

11. Yamaguti S. Systema Helminthum, vol. 3. The nematodes of vertebrates, part 1 and 2. Inter-science Publishers, 1961; New York, USA

12. Kennedy MJ, Mackinnon JD. Site segregation of *Thelazia skrjabini* and *Thelazia gulosa* (Nematoda; Thelazioida) in the eyes of cattle. J Parasitol. 1994; 80:501-504.

13. Ghirotti M, Iliamupu DS. *Thelazia rhodesii* (Desmarest, 1828) in cattle of Central Province, Zambia, Parasitologia 1989; 31(2-3):231-7.

14. Kennedy MJ. Prevalence of eyeworms (Nematoda: Thelazioida) in beef cattle grazing different range pasture zones in Alberta, Canada. J Parasitol. 1993; 79(6):866-9.

15. Adamu A, Bogale B, Chanie M, Melaku A, Fentahun T. Prevalence and Risk factors for Bovine thelaziosis in Mecha District, Amhara Regional State, Northwest Ethiopia. Int J A Vet Med Sci. 2011; doi:10. 5455/ijavms. 13040 (In press).

16. Van Aken D, Dargantes AP, Lagapa JT, Ver-cruysse J. *Thelazia rhodesii* (Desmarest, 1828) infections in cattle in Mindanao, Philippines. Vet Parasitol. 1996; 66(1-2):125-9.

17. Dunn AM. Veterinary helminthology. 2nd ed., William Heinemann Medical Books, 1978, London, UK.