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Original Article

Cerebrospinal Nematodiasis of Cattle, Sheep and Goats in Iran

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Abstract

Background: The prevalence of setariasis in cattle and cerebrospinal nematodiasis in sheep and goats were determined in two geographical regions of Iran.

Methods: In two provinces of Iran: Mazandaran (zone I) and Qazvine (zoneII) where sheep and goats were suffering from symptoms similar to cerebrospinal nematodiasis, the peritoneal cavities of 763 and 1020 cattle were searched for adult *Setaria* sp. respectively. History taking of 4770 sheep from zone I and 25550 sheep and 3190 goats from zone II were performed for the presence and determination of cerebrospinal nematodiasis in sheep and goats. To study pathological changes induced in central nervous system 7 sheep from zone I and 4 sheep and 2 goats from zone II with symptoms similar to CSN were necropsied.

Results: Our findings revealed that 47% and 13.2% of cattle in zone I and II harboured *Setaria digitata* (99.45%) and *S. digitata* (67.12%) plus *S.labiato–papillosa* (17.46%) respectively. History taking showed that each year 2.53% of sheep in zone I and 1.65% of sheep and 1.25% of goats in some districts of zone II (e.g. Roudbar Alamout) suffered from symptoms similar to cerebrospinal nematodiasis the main clinical signs of which were difficulty in hind limbs movement (lumbar paralysis).

At necropsy, no lesions were observed macroscopically in the brains as well as spinal cords. But in a few cases, central nervous system were congested and edematous .Histopathological examination of CNS of necropsied animals showed mild leptomeningitis and eosinophilic and lymphacytic encephalomyelitis with numerous hemorrhagic tracts, degeneration and necrosis due to migration of the larvae. The cross section of nematode larvae was observed in the brain section of a sheep in zone I.

Conclusion: The results of this study showed that setariasis of cattle is very prevalent in both region mainly in zone I and sheep and goats harbor low percentage of CSN but with marked pathological lesions.

Keywords: *Setariasis, Cerebrospinal nematodiasis, Ruminants, Iran*

Introduction

The role of nematodes in production of neurological disorders in animals is a global problem (1). *Setaria* species the main causative agent of CSN are filarial parasites commonly found in peritoneal cavity of cattle and other ungulates.

The adult parasites are generally considered to be non pathogenic in their natural hosts, but transmission of infective larvae through mosquito and other arthropods vector to non per-

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missive hosts such as goats, sheep, cattle, horse and man, can result in serious and often fatal neuropathological disorders commonly referred to a cerebrospinal nematodiasis (2).

Other parasites can also be responsible for producing CSN. Small ruminants that share pastures with the white tailed deer may become infected with meningeal worm *Parelaphostrongylus tenuis* (3) and *P. odocoilei* in experimentally infected tinhorn sheep (4).An outbreak of neurofilariosis in young goats due to unknown filarial worm is reported from Saudi Arabia (5).

This study was carried out to investigate setariasis of cattle and cerebrospinal nematodiasis in sheep and goats in Iran.

Materials and Methods

This study was conducted in Mazandaran (zone I) along the Caspian Sea with warm and humid climatic condition and Qazvin Province (Zone II) North West of Iran with a range of climatic conditions from semi-dry to hot and humid. In zone I and II peritoneal cavities of 763 and 1020 cattle were searched for *Setaria* sp. respectively

Meanwhile history taking of 4770 sheep from zone I and 25550 sheep and 3190 goats from zone II was performed for determination of the occurrence of CSN clinical signs. Seven sheep from zone I, four sheep, and two goats from zone II with CSN symptoms were selected for necropsy. Their brains and spinal cords were fixed in 10% natural formalin and then embedded in paraffin, sectioned at 5 microns (μ) and subsequently were stained with hematoxylin eosin (H&E). Ch^2 was used for evaluation the results.

Results

Abattoir findings

The results of cattle setariasis are summarized in Table I. Accordingly; setariasis was more prevalent in zone I. Meanwhile *S. digitata* was the dominant species in either zone.

Clinical findings

On the basis of taking history of 4470 sheep from zone I and 25550 sheep and 3190 goats from zone II, 2.53% and 1.65% and 1.25% of animals suffered from symptoms similar to CSN syndromes, respectively. Generally, the earliest clinical signs were inability to walk in straight direction in association with deviation of lumbar, which indicated hindquarter weakness. In the next step, incoordination & ataxia were appeared. At this stage, the affected animals fall insidiously or rapidly post driven or threatened and become recumbent. In some cases both fore and hind limbs became week and recumbency took place very soon (Fig1).Meanwhile some of the affected animals suffered from neck deviation.

Necropsy findings

No gross lesions were observed in either abdominal or thoracic cavities of affected cattle and brains and spinal cords of necropsied animals. Although a few cases of slight congestion and edema were seen in meninges and brain tissues and in one case small hemorrhages were noticed in spinal cord and in cerebral leptomeninges. Cross sections of brain in one animal revealed randomly areas of brownish hemorrhages in the parenchyma.

Histopathologic findings

Numerous hemorrhagic tracts, degeneration and necrosis due to migration of the larvae were prominent in brain and spinal cord (Fig.2).

Malacia, gliosis, scattered glial nodules with infiltration of lymphocytes, plasma cell, neutrophil & eosinophil were seen in affected areas (Fig. 2). Severe pervascular cuffing (PVC) with inflammatory reaction mostly eosinophil and mononuclear were prominent in some meningeal and brain vessels. In some cases, the presence of gitter cells in the margins of affected areas was noticed. In a section of the brain, the cross section of larvae was seen (Fig.3).Disruption and destroyed brain tissue due to migration of parasite lead to microcavitation (Fig.3).

Table 1: The prevalence of *Setaria* spp. in cattle in zone I and II in Iran

Geographical regions	No. cattle examined	% infection	Mean No. worm	% Parasite species	
				S.digitata	***S.labiato - papillosa***
Mazandaran (zone I)	763	47	2.5	99.45	-
Qazvin (zone II)	1020	13.2	3.8	67.12	17.46

Fig. 1: Recumbancy due to CSN

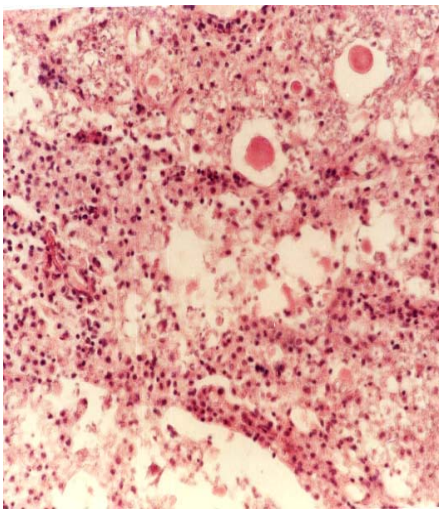

Fig. 2: *Setaria* microfilaria section, PVC, hemorrhage, gliosis and tissue necrosis (H&E) X200

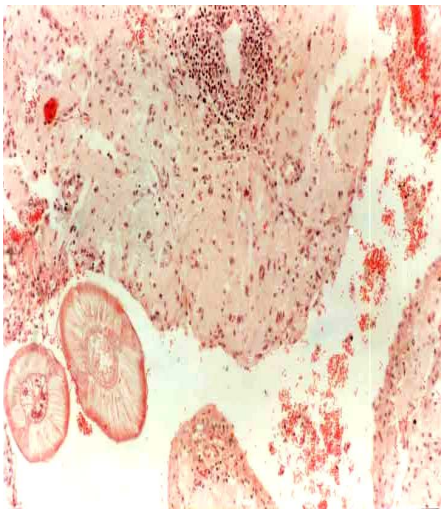

Fig. 3: Demyelination, axon swelling, status spongiosus infiltration of lymphocytes, plasma cells and eosinophil in spinal cord tissues may be due to the microfilaria. (H&E) X200

Discussion

It is a common practice in most rural areas of Iran, to rear sheep and goats in the same pasture with cattle and buffaloes and therefore the chances of sheep and goats being affected with CSN are much higher when the natural hosts are infected.

S. digitata in cattle as well as CSN in sheep was firstly reported from Gilan, in Caspian Sea region (6) and then setariasis of buffaloes in Urmia North West of Iran (7). In the present study 47% and 13.2% of cattle in zone I and II harbored *Setaria* in their peritoneal cavities respectively. The high and low percentages of setariasis of cattle in zone I and II is a reflection of climatic conditions on the development of mosquito intermediate hosts. Zone I is more rainy and humid in most months of the year and is the main land in Iran for cultivation of rice. More or less similar conditions govern in hot and humid part of zone II e.g Roudbar–Alamout, where due to vicinity to large rivers is suitable for cultivation of rice and development of intermediate hosts of *Setaria* sp.

The occurrence of setariasis and CSN under these climatic conditions leads us to search for the occurrence of CSN in other provinces of Iran, among which East Azerbaijan (8) and Zanjan (Bazargani personal communication) were infected.

Geographically, our findings are in accordance with other workers, because most of the affected regions including Japan (9) India (10) Taiwan (11) Korea (12) Srilanka (13) are located in warm and humid regions of the world.

Our clinical, epidemiological and histopathological findings are mostly similar with other workers (2) Although is different with histopathological pictures of central nervous system lesions produced by *S.digitata* and *S. marshalli* in cattle of Taiwan, in which no purulent encephalomyelitis, granulomatous ependymitis and slight to severe demyelinization of the roots of spinal nerves were observed (2).

Meanwhile asymmetric irregular tracts of disrupted necrotic tissues with macrophage infiltration in the CNS of affected animals have been reported in sheep and goats cerebrospinal nematodiasis due to *P.tenuis* (3). Thus, the larvae of some other nematodes may also cause CSN in small ruminants.

In addition, demyelinization of the CNS nerves has been attributed in the action of matrix metalloproteinase (MMPS) that were secreted by the inflammatory cell (14).

The diffuse parasite migration can be the cause of abnormal upper and lower motor neuron signs as with cerebrospinal nematodiasis in sheep and goats (15). Meanwhile, lumbar paralysis and incoordination might be caused by demyelination of nerve fibers due to migration, mechanical lesions due to migration and or toxic secretory products of larvae (16).

In our studies, cross sections of parasite larvae were seen in the brain tissues of one out of 13 affected animals. It should be pointed out that the failure in demonstration of larvae in section taken from CNS is common, because the parasite has been encounter in lesions free areas (16). The explanation is, after killing or euthanasia of the ill host, the removal and immersion of CNS tissues in 10% formalin, is a noxious stimulus to viable larvae, triggering their further migration in the neuroparanchyma until their death by fixative (16). We found that setarisis is a common parasite of cattle in studied regions mainly in zone I and its microfilaria can produce pathological lesions in infected sheep and goats

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The authors declare that they have no Conflict of Interests

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