Coenurus cerebralis and its pathology in an organized farm of Tamil Nadu

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Abstract Coenurosis is a disease of the central nervous system in sheep. A survey was carried out to assess the occurrence of *Coenurus cerebralis* in Madras red sheep. A prevalence rate of 12.30 % observed when 122 slaughtered Madras red sheep were examined in an organized farm during 2002 to 2007 at Livestock Research Station, Katupakkam, Tamil Nadu, India. The skulls of the animals were opened to know the prevalence of *Coenurus* cyst in the brain. Out of 12.30 %, only 3.28 % sheep showed clinical signs while the remaining were apparently healthy (9.02 %). *C. cerebralis* cysts were observed in cerebrum, cerebellum and on spinal cord, averaging 66.67, 26.67 and 6.66 %, respectively. Among different age groups of sheep, highest infection rate was observed in rams (20.69 %) followed by ewes (10.00 %), young males (9.09 %) and young females (8.33 %). Males (17.50 %, 7/40) were more infected compared to the female sheep (9.76 %, 8/82). Grossly, ventral cerebrum was congested and depression in sulci was noticed. Posterior portion of the skull showed severe congestion and haemorrhage. Severe congestion was also noticed on the gyri of right cerebral hemisphere.

Keywords *Coenurus cerebralis* · Prevalence · Pathology · Sheep · Tamil Nadu · India

Introduction

Coenurosis is caused by *Coenurus cerebralis* in brain and spinal cord of sheep (Sharma and Chauhan 2006; Scott 2012; Oryan et al. 2014). *Coenurus* cyst is more common in sheep (Mishra 1977; Karim 1979; Nassef et al. 1990; Akkaya and Vurusaner 1998; Achenef et al. 1999; Biyikoglu et al. 2001) but also occurs in goats (Ahmed and Ali 1972; Sharma and Bhatia 1978; Saikia et al. 1987; Dey et al. 1988; Gogoi et al. 1991; Khan et al. 1996; Nooruddin et al. 1996; El-Sinnary et al. 1999), buffalo (Gupta and Chowdhury 1985; Yoshino and Momotani 1988), cattle (Sanyal and Sinha 1983; Yoshino and Momotani 1988; Moghaddar et al. 1992; Islam and Rahman 1997; Akkaya and Vurusaner 1998), horses (Fraser 1991), cat (Bowman and Lynn 1995) and human (Soulsby 1982; Ing et al. 1998). Normally *Coenurus* cyst remains restricted to CNS and spinal cord. However, it is also seen in muscles and subcutaneous tissues in sheep (Aslani 1999 and Aslani and Razmi 2001). Scott (2012) opined that the cyst is mostly located in one cerebral hemisphere (80–90 % of cases), cerebellum (5–10 % of cases) and multiple locations in the brain (5–8 % of cases). The present study deals with the prevalence and its pathology of *Coenurus*.

Materials and methods

Study area

Prevalence of coenurosis was studied in an organized sheep farm of Madras red sheep breed located in tropical climate

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System of management

The animals were maintained under semi intensive system of management. They were provided stall feeding of concentrate, besides 8 h daily grazing on pasture. Concentrates were given @ 300, 200, 100 g/day for ram, does and hoggets, respectively.

Parasitological examination

A total number of 122 (29 rams, 70 ewes, 11 young males and 12 young females) slaughtered Madras red sheep were examined in an organized farm during 2002 to 2007 at Livestock Research Station, Kattupakkam, Tamil Nadu, India. Coenurosis in affected sheep was identified based on clinical signs. The skulls of the animals were opened to understand the prevalence of *Coenurus* cyst in the brain. Grossly, the pathological lesion on the brain and the spinal cord was recorded.

Results and discussion

In the present study, prevalence rate of *C. cerebralis* cysts in Madras red sheep was 12.30 % (Table 1). Similar findings were observed by Gicik et al. (2007), Tavassoli et al. (2011) and Anwar et al. (2013), who found that 15.50, 18.65 and 18.30 % of sheep were infected with *C. cerebralis* cysts in Turkey, Iran and Egypt, respectively. Other authors reported the prevalence of *Coenurus* cysts in brain ranging from 0.35 to 9.8 % in sheep (Panisup et al. 1979; Karim 1979; Akkaya and Vurusaner 1998; Varma and Malviya 1989; Oryan et al. 1994; Bussell et al. 1997; Achenef et al. 1999; Abo-Shehada et al. 2002; Scala et al. 2007). Paltrinieri et al. (2010) reported highest prevalence of 39.5 % cerebral coenurosis with 85.1, 11.2 and 3.7 % of migratory lesions, cystic lesions and both lesions, respectively in sheep in Italy. However, Desouky et al. (2011)

recorded a 100 % infection in sheep in Egypt. Gicik et al. (2007) observed highest level infection of coenurus cysts in Morkaraman sheep (15.9 %) than Akkaraman sheep breed (14.1 %) in Turkey, while Tavassoli et al. (2011) reported highest infection rate in Haraki breed (27.77 %) followed by Ghezel breed (21.13 %) and Makoie breed (23.91 %) in Iran.

Out of 12.30 %, only 3.28 % sheep (4) showed clinical signs and remaining (11) were apparently healthy (9.02 %), while the prevalence of *Coenurus* cyst in apparently healthy sheep was 3–4.71 % (Parihar 1988 and Achenef et al. 1999). It's difficult to identify the coenurosis in sheep clinically because the live animals do not show the symptoms (Sharma and Chauhan 2006).

In the present study, *C. cerebralis* cysts were observed in cerebrum, cerebellum and on spinal cord, averaging 66.67, 26.67 and 6.66 % respectively. In accordance Achenef et al. (1999) has reported 96 % of *Coenurus* cysts in cerebrum and 4 % in cerebellum. Edwards and Herbert (1982) observed the cysts in the occipital area of Welsh, Mountain, Suffolk and Dorset sheep, while Haridy et al. (2013) reported the cysts in the left lateral cerebral ventricle of a Rahmani ewe. However, cysts in the muscle and subcutaneous tissues have been reported in sheep (Aslani 1999; Aslani and Razmi 2001) and goats (Soulsby 1982; Sharma et al. 1995).

Among different age groups of sheep, highest infection rate was observed in rams (20.69 %) followed by ewes (10.00 %), young males (9.09 %) and young females (8.33 %). Infection rate was observed more in adults above 12 months (13.13 %, 13/99) compared to young sheep with 4–12 months (8.70 %, 2/23) which is similar to that of Sharma et al. (1998) who reported 90 % of coenurosis cyst in adult goats (> 1 year). However, in Jordon, Abo-Shehada et al. (2002) observed 10 % of *Coenurus* cysts in 0.5–2.5 years old sheep.

In the present study, the disease was more common in adults. A similar report was recorded by Doherty et al. (1989) in Ireland, Varma and Malviya (1989) in India and Bussell et al. (1997) in Australia. In contrast, Karim (1979) and Ligios et al. (2004) recorded that sheep more than 1 year old become much less susceptible to the parasite.

Males (17.50 %, 7/40) were more infected compared to the female sheep (9.76 %, 8/82) which is in dissimilar to that of Karim (1979) and Gicik et al. (2007).

In the present study, 1.64 (2/122) % mortality was observed which is in agreement with that of Sharma et al. (1998) who reported 1.14 % mortality in goats under semi-intensive system of management. While Njau et al. (1988) and Biyikoglu et al. (2001) reported 5 and 24.61 % mortality in sheep due to coenurosis in Ethiopia and Turkey, respectively. In the present study two animals showed circling movement and blindness due to the cyst in the

Table 1 Prevalence of *Coenurus cerebralis* cysts in sheep

Year	No. animals examined	Animals infected (%)
2002–2003	31	12.90 (4)
2003–2004	32	6.25 (3)
2004–2005	21	9.52 (2)
2005–2006	17	17.64 (3)
2006–2007	21	14.29 (3)
Total	122	12.30 (15)

Parenthesis indicates no. of animals

Fig. 1 Skull—pressure atrophy due to *Coenurus cerebralis* cysts

Fig. 2 *Coenurus cerebralis* cysts in Cerebrum with depressed area

brain which is in agreement with that of Edwards and Herbert (1982) and Gicik et al. (2007) who observed clinical signs like circling, head pressing, and blindness due to the presence of the cyst in the cerebrum.

Grossly, posterior portion of the skull showed severe congestion and haemorrhage (Fig. 1). Ventral cerebrum was congested and depression was noticed in sulci. Severe congestion was also noticed on the gyri of right cerebral hemisphere. Cystic pressure caused depression which lead to lack of gyri and sulci differentiation (Fig. 2). Cysts were also found in cerebellum (Fig. 3). Similar observations were also made in coenurosis in goat in India and a wild ewe in Iran (Gogoi et al. 1991; Tafti et al. 1997; Sharma et al. 1998). Meninges revealed hyperplasia and liquifactive necrosis as recorded by Anglo and Belchev (1986) in sheep. Ligios et al. (2004) observed reddish-yellow lines of necrotic-suppurative inflammation due to onchosphere migration.

Fig. 3 *Coenurus cerebralis* cysts in Cerebellum

Conclusion

Coenurosis in sheep was recorded in 12.30 %, of which 66.67, 26.67 and 6.67 % were observed in cerebrum, cerebellum and spinal cord, respectively. Rams showed higher incidence.

References

- Abo-Shehadeh MN, Jebreen E, Arab B, Mukbel R, Torgerson P (2002) Prevalence of *Taenia multiceps* in sheep in northern Jordan. *Prev Vet Med* 55:201–207
- Achenef M, Markos T, Feseha G, Hibret A, Tembely S (1999) *Coenurus cerebralis* infection in Ethiopian highland sheep: incidence and observations on pathogenesis and clinical signs. *Trop Anim Health Prod* 31:15–24
- Ahmed S, Ali MI (1972) Incidence of *Coenurus cerebralis* in goats in Bangladesh. *Indian Vet J* 49:1157–1158
- Akkaya H, Vurusaner C (1998) *Coenuriasis cerebralis* in sheep and calves slaughtered in Istanbul. *Acta Parasitol Turc* 22:320–324
- Anglo AK, Belchev L (1986) Clinical symptoms and pathology of acute ovine coenuriasis. *Vet Med Nauki* 23:19–22
- Anwar S, Mahdy E, El-Nesr KA, El-Dakhly KM, Shalaby A, Yanai T (2013) Monitoring of parasitic cysts in the brains of a flock of sheep in Egypt. *Rev Bras Parasitol Vet Jaboticaba* 22:323–330
- Aslani MR (1999) Aberrant coenurosis in ewe. *J Appl Anim Res* 16:97–99
- Aslani MR, Razmi GhR (2001) Muscular coenurosis in sheep. *J Vet Parasitol* 15:157–158
- Biyikoglu G, Bagci O, Oncel T (2001) A coenurosis outbreak of sheep in Istanbul, Turkey. *Pendik Vet Mikrobiyol Derg* 32:27–30
- Bowman DD, Lynn RC (1995) *Goergis parasitology*, 6th edn. Saunders Company, London, pp 1–141
- Bussell KM, Kinder AE, Scott PR (1997) Posterior paralysis in a lamb caused by a *Coenurus cerebralis* cyst in the lumbar spinal cord. *Vet Rec* 24:560
- Desouky EA, Badawy AI, Refaat RA (2011) Survey on coenurosis in sheep and goats in Egypt. *Vet Ital* 47:333–340
- Dey PC, Nayak DC, Mohanty DN, Nayak S, Patnaik GM (1988) A brief note on massive infection of *Coenurus gaigeri* cysts in a desi goat. *Indian Vet J* 65:166

- Doherty ML, Bessett HF, Breathnach R, Monahan ML, McErlean BA (1989) Outbreak of acute coenuriasis in adult sheep in Ireland. *Vet Rec* 125:185
- Edwards GT, Herbert IV (1982) Observations on the course of *Taenia multiceps* infections in sheep: clinical signs and post-mortem findings. *Br Vet J* 138:489–500
- El-Sinnary KA, Tageldin MH, Al-Sumry HS (1999) Outbreak of coenurosis (*Taenia* species) in anglo-nubian goat in the Sultanate of Oman. *Vet Rec* 144:296–297
- Fraser GM (1991) The Merck veterinary manual: handbook of diagnosis—therapy and disease prevention and control for veterinarians. Merck and Co Inc, Rahway, p 604
- Gicik Y, Kara M, Arslan MO (2007) Prevalence of *Coenurus cerebralis* in sheep in Kars province, Turkey. *Bull Vet Inst Pulawy* 51:379–382
- Gogoi D, Lahon DK, Bhattacharya M, Lekharu JC (1991) Histopathological studies on coenurosis in goat. *Indian J Anim Sci* 61:283–285
- Gupta PP, Chowdhury N (1985) Cerebral coenurosis in a buffalo. *Indian Vet J* 62:613–614
- Haridy M, Sakai H, El-Nahass E, El-Morsey A, Anwar S, Yanai T (2013) *Coenurus cerebralis* cysts in the left lateral cerebral ventricle of a ewe. *J Vet Med Sci* 75:1643–1646
- Ing MB, Schantz PM, Turner JA (1998) Human coenurosis in North America: case reports and review. *Clin Infect Dis* 27:519–523
- Islam AWMS, Rahman MS (1997) A report on incidence of gid of calves of Bangladesh. *Indian J Anim Health* 36:187–188
- Karim MA (1979) A survey of coenurosis in sheep in Northern Iraq. *Trop Anim Health Prod* 11:157–158
- Khan MQ, Cheema AH, Anwar M (1996) *Coenurus cerebralis* in a goat. *Pak Vet J* 16:146–148
- Ligios C, Viglietti A, Carta P, Dexter G, Agrimi U, Simmons MM (2004) Clinicopathological findings in sheep from sardinia showing neurological signs of disease. *Vet Rec* 20:365–370
- Mishra KC (1977) *Coenurus cerebralis* in goat. *Orissa Vet J* 11:495–501
- Moghaddar N, Oryan A, Gaur SNS (1992) Coenurosis in cattle in Iran. *J Appl Anim Res* 2:119–121
- Nassef MT, Youssef MS, Taha MS, Ahmed LS, Bayoumi AH (1990) Studies on *Coenurus cerebralis* in sheep. *Assiut-Vet Med J* 23:211–219
- Njau BC, Kasali OB, Scholtens RG, Mesfin D (1988) Review of sheep mortality in Ethiopian highlands (ILCA Bulletin No. 31, Addis Ababa, Ethiopia) 19–22 (cited by Achenef M, Markos T, Feescha G, Hibret A, Tembley S (1999) *Coenurus cerebralis* infection in Ethiopian highland sheep: incidence and observations on pathogenesis and clinical signs. *Trop Anim Health Prod* 15–24)
- Nooruddin M, Dey AS, Ali MA (1996) Coenurosis in Bengal goats of Bangladesh. *Small Rumin Res* 19:77–81
- Oryan A, Moghaddar N, Gaur SNS (1994) Metacestodes of sheep with special reference to their epidemiological status, pathogenesis and economic implications in Fars Province Iran. *Vet Parasitol* 51:231–240
- Oryan A, Akbari M, Moazeni M, Amrabad OR (2014) Cerebral and non-cerebral coenurosis in small ruminants. *Trop Biomed* 31:1–16
- Paltrinieri S, Varcasia A, Cazzaniga S, Giordano A, Pipia AP, Marrosu R, Scala A (2010) Brain creatine kinase isoenzyme (CK-BB) as a possible biomarker for the diagnosis in vivo of ovine coenurosis in a naturally infected flock. *Small Rumin Res* 94:180–184
- Panisup AS, Gaba SC, Bhatnagar VK (1979) Incidence of coenurosis in sheep in Hissar. *Haryana Vet* 18:53–55
- Parihar NS (1988) Pathology of *Coenurus cerebralis* in ovine subclinical infection. *Indian J Anim Sci* 56:539–543
- Saikia J, Pathak SC, Barman AK (1987) Coenurosis in goats. *Indian Vet Med J* 11:135–141
- Sanyal PK, Sinha PK (1983) Caprine metacestodiasis: incidence in West Bengal. *Haryana Vet* 22:38–40
- Scala A, Cancedda GM, Varcasia A, Ligios C, Garippa G, Genchi C (2007) A survey of *Taenia multiceps* coenurosis in Sardinian sheep. *Vet Parasitol* 143:294–298
- Scott PR (2012) Diagnosis and treatment of coenurosis in sheep. *Vet Parasitol* 189:75–78
- Sharma SD, Bhatia YS (1978) Coenurosis in goat: a case report. *Indian Vet Med J* 2:217–218
- Sharma DK, Chauhan PPS (2006) Coenurosis status in Afro-Asian region: a review. *Small Rumin Res* 64:197–202
- Sharma DK, Sanil NK, Agnihotri MK, Singh N (1995) Subcutaneous coenurosis in Barbari goat. *Indian Vet J* 72:1203–1205
- Sharma DK, Nem Singh, Tiwari HA (1998) Prevalence and pathology of coenurosis in organized goat farms. *J Vet Parasitol* 12:30–32
- Soulsby EJJ (1982) Helminths arthropods and protozoa of domesticated animals, 7th edn. ELBS and Bailliere Tindall, London, pp 117–119
- Tafty AK, Oryan A, Maleki M (1997) Pathological changes due to coenurosis in a wild ewe in Iran. *J Vet Parasitol* 11:65–68
- Tavassoli M, Malekifard F, Soleimanzadeh A, Tajik H (2011) Prevalence of *Coenurus cerebralis* in sheep in Northwest of Iran. *Vet Res Forum* 2:274–276
- Varma TK, Malviya HC (1989) Prevalence of coenurosis in sheep, goat and pigs in Bareilly, Uttar Pradesh. *J Vet Parasitol* 3:69–71
- Yoshino T, Momotani E (1988) A case of Bovine Coenurosis (*Coenurus cerebralis*) in Japan. *Jpn J Vet Sci* 50:433–438