

CLINICAL, SOME EPIDEMIOLOGICAL AND RISK FACTORS STUDIES OF COENUROSIS IN SHEEP AT DAKAHLIA GOVERNORATE, EGYPT

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ABSTRACT

This study was carried on 747 sheep located in Dakahlia Governorate, Delta region, Egypt, over one year (March 2014 to February 2015). Out of them 43 sheep showed different nervous signs. The diseased sheep were incised and examined for the presence of *Coenurus cerebralis* cysts to study the clinical, risk factors, and some epidemiological pattern of coenurosis. Brain samples from 43 diseased sheep from four localities in Dakahlia Governorate were collected. The various nervous clinical signs of coenurosis were presented in variant degrees regarding to the affected site and location of the coenurus cyst. The clinical manifestation represented by head tilting 42%, head pressing 3.48%, dropping of ears 49%, circling 70%, blindness 16%, recumbency 30%, and posterior paralysis 11.53%. The relationship between the site of coenurus cyst and the manifested clinical signs could help in predicting the location of the cyst from the clinical signs for further interference specially in case of valuable animals. A significant correlation was detected between prevalence of coenurosis, rearing system, availability of dogs & fox and locality at P-values < (0.019, 0.019 and 0.044, respectively). The risk factors and epidemiological patterns could help in developing control measures.

Key words: *Coenurus cerebralis*, epidemiology, risk factors, sheep, Egypt.

INTRODUCTION

Coenurosis is a fatal disease of sheep and goats caused by *T. Multiceps* which is characterized by nervous manifestations including circling, blindness, head deviation and mortalities (Njau *et al.*, 1988, Biyikoglu *et al.*, 1998 and EL Beskawy *et al.*, 2016) the economic impacts of this disease were a significant (Bussell *et al.*, 1997 and Achenef *et al.*, 1999).

Coenurus cerebralis is the metacystode of the tapeworm *Taenia multiceps*. Domestic and wild canids constitute the predators, while a wide range of herbivores, including small and large ruminants, yak and equines are the prey hosts, (Sharma and Chauhan 2006). This parasite usually inhabits the central nervous system specially the left and right cerebral hemispheres of herbivores. (Desouky *et al.*, 2011).

The prevalence of sheep coenurosis was reported in many countries like in Iran (9.8%) Oryan *et al.* (1994), in Turkey (1.3%) Akkaya and Vurusaner, 1998; in Jordan (3%) Abo-Shehada *et al.* (2002); in Italy (0.35%) Scala *et al.* (2007); and (5%) in Brazilian sheep (Gazioglu *et al.*, 2017), and in Egypt overall infection rate was (3.03%) Amer *et al.* (2017) and (2.3%) (EL Beskawy *et al.*, 2016) and *C. cerebralis* cysts were found in (3.7%) out of the examined sheep of the involved sheep population. (Abbas and EL Beskawy 2016).

This study was aimed primarily to investigate the most common risk factors associated with occurrence of coenurosis in different geographical regions of Dakahlia Governorate, Egypt. Further more the relationship between site of coenurosis cyst and the manifested clinical signs of diseased animals.

MATERIALS AND METHODS

1- Studied area

Dakahlia Governorate, is about 3459 kilometers square located in the northeast of the delta region, Egypt, has a large number of animals specially sheep (119850 heads). Sheep flocks in these localities were varied in their numbers from sixty to up to one

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hundred per flock, Table (1) and Fig.(1), but all of them participate the same regimen of grazing as semi-fixed flocks. The migratory nature of these flocks from place to place, rendered them in contact with other flocks and sometimes with wild animals.

Questionnaire includes the different risk factors as age, sex, circling radius (wide or narrow), disposal of offal by (burning, burrier, in water canals, or introduction to dogs within the flocks), contact with dogs and other carnivores as foxes, periodic treatment of in contact dogs, the site of the cyst in the cerebrum, cerebellum or spinal cord and the type of rearing (inside or outside doors), were fully discussed.

2- Animals

From March 2014 to February 2015, 747 sheep located in Dakahlia Governorate, Delta region, Egypt, were examined according to (Constable *et al.*, 2017) 43 animals showed different nervous signs which were recorded. The diseased animals were slaughtered and postmortem examination were done according to (Harris 1998).

3- Samples collection

Forty three brain samples were obtained after palpation and incision of brains from 43 diseased sheep showing typical nervous signs of coenurosis all over one year (March 2014 to February 2015). Identification and examination of cysts were done in Parasitology Department, Faculty of Veterinary Medicine, Mansoura University, Egypt, All procedures were approved by the Ethical Committee for Animal Experiments, Mansoura University, Egypt.

4- Statistical analysis

Data analysis were performed using SPSS version 16.0 (SPSS). Difference in occurrence of clinical signs according to cyst site (cerebrum and cerebellum) were statistically evaluated using (crosstabs) Chi-square test to compare their distribution. The chi-squared test was used to determine whether there was a significant difference between the expected frequencies and the observed

frequencies in our outcomes. Also, non parametric correlation test (Kendall's tau-b and Spearman's rho correlation tests were used to test the relation between disposal of offals, prevalence of cysts and (age, sex, locality, type of rearing and presence of dogs & fox). It assesses how well the relationship between variables can be described using a monotonic function. SPSS, (2004).

RESULTS

Forty three sheep out of 747 sheep in four localities, showed different nervous signs by clinical examination (Table 1). The various nervous signs were head tilting 42%, dropping of ears 49%, circling 70%, blindness 16% and recumbency 30%, (Table 2 & Figs.2-8). Twenty six out of 43 diseased sheep showed *Coenurus Cerebralis*. cyst, revealed prevalence of 3.48%. The cysts was located in the cerebral hemispheres, and the cerebellum (Figs 9-14).

The frequency of coenurosis in different localities was 42.33%, 19.23%, 23.07%, and 15.38% for Belkas, Mansoura, Dikrnis and Aga respectively, (Table 3). Furthermore, it was 30.76% and 69.23% for male and female respectively, in addition to the site of the cyst, the frequency of coenurosis was 80.76% for cerebrum and 19.23% for cerebellum, while rearing system as outdoor rearing was presented by 61.53% and indoors was 38.46% (Table 3).

A highly significant difference in the distribution of cysts was detected in wide circling and narrow circling and it was high in the cerebrum in a wide circling, but it was high in cerebellum in case of narrow circling and no significant difference were detected in other signs due to the effect of the cyst (Table 4).

A significant correlation was detected between prevalence of cysts and (rearing system, availability of dogs & fox and locality) at P-value (0.019, 0.019 and 0.044, respectively table (5).

Table 1: Area of study and numbers of samples:

Area	Total number Of examined sheep	Number of sheep showing nervous signs
Belkas	583	25
Mansoura	58	5
Dikirnis	44	6
Aga	62	7
Total	747	43

Table 2: percentage of different clinical signs of coenurosis infected sheep.

Clinical signs	No. of Coenurosis infected sheep Total No. (26)	Percent (%)
Head tilting	18	42%
Head pressing	1	3.84%
Dropping of ears	21	49%
Circling	22	70%
Blindness	7	16%
Recumbency	13	30%
Posterior paralysis	3	11.53%

Table 3: Presence of Coenurosis infected sheep according to locality, sex, location of the cyst, age and breeding system.

Items	Criteria	Frequency(No.=26)	Percent
localty	Belkas	11	42.33%
	Mansoura	5	19.23%
	Dikirnis	6	23.07%
	Aga	4	15.38%
sex	male	8	30.76%
	female	18	69.23%
Location of cyst	cerebrum	21	80.76%
	cerebellum	5	19.23%
Rearing system	Outdoors	16	61.53%
	indoors	10	38.46%
Age	0 – 3 months	0.0	0.0 %
	4 Months – 1 year	11	42.33%
	>1year – 2 years	6	23.07%
	>2years	9	34.61%

Table 4: The effect of location of the cyst and outcome of different clinical signs.

Cyst location signs	Chi- Value	df	P-value
Location of cysts * Head tilting	0.434	1	0.510 ^{N.S}
Location of cysts * Wide circling	20.63	1	0.000 ^{**}
Location of cysts * Narrow circling	26.00	1	0.000 ^{**}
Location of cysts *Head pressing	0.248	1	0.619 ^{N.S}
Location of cysts * Dropping ears	2.23	1	0.135 ^{N.S}
Location of cysts * Posterior paralysis	4.91	1	0.085 ^{N.S}
Location of cysts * blindness	1.47	1	0.225 ^{N.S}
Location of cysts * recumbency	0.516	1	0.473 ^{N.S}

A highly significant difference in the distribution of cysts were detected in wide circling and narrow circling and it was high in cerebrum in wide circling but it was high in cerebellum in case of narrow circling and no significant difference were detected in other signs due to the effect of the cyst.

Table 5: Different risk factors affecting prevalence of coenurosis infected sheep.

Bivariate correlation	Kendall's tau-b	Spearman's rho correlation
Prevalence of coenurosis*presence of dogs	-0.243 (p< 0.148) ^{N.S}	-0.289 (p< 0.152) ^{N.S}
Prevalence of coenurosis *removal of disposal	-0.195(P<0.255) ^{N.S}	-0.232 (p< 0.264) ^{N.S}
Prevalence of coenurosis * type of rearing	0.395(p<0.019)*	0.470 (p< 0.015)*
Prevalence of coenurosis *availability of dogs&fox	-0.393(p<0.019)*	-0.468 (p< 0.016)*
Prevalence of coenurosis *age	0.218(p<0.156) ^{N.S}	0.286 (p< 0.156) ^{N.S}
Prevalence of coenurosis *sex	0.332(p<0.048) ^{N.S}	0.395 (p< 0.046) ^{N.S}
Prevalence of coenurosis *locality	0.312(p<0.044)*	0.413 (p< 0.036)*

A significant correlation was detected between prevalence of cysts and (rearing system, availability of dogs & fox and locality) at P-value< (0.019, 0.019 and 0.044, respectively)



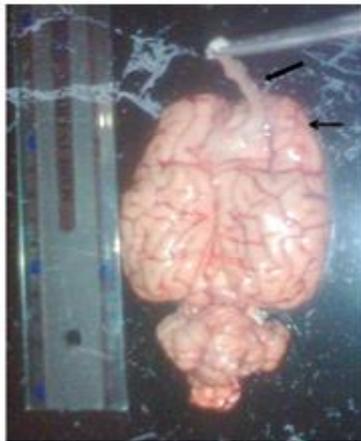


Fig. (9): C. Cerebralis cyst (thick arrow), Right frontal lobe (thin arrow) sheep brain



Fig. (10): C. Cerebralis cyst (thick arrow), left parietal lobe (thin arrow) of sheep brain

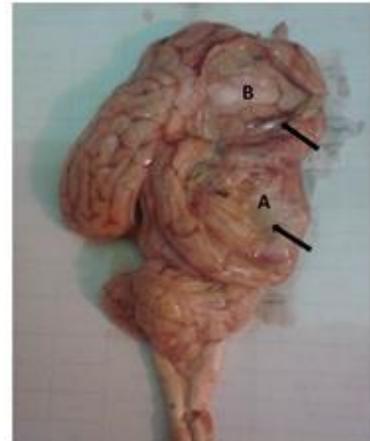


Fig. (11): Cavitory lesions of C. Cerebralis (arrow), right occipital (A)& frontal lobe (B) sheep brain



Fig. (12): C. Cerebralis cyst cavity (thick arrow), right occipital lobe) of sheep brain



Fig. (13): Two C. Cerebralis cysts (thin arrows), Formed cavities (thick arrows) left parietal lobe of sheep brain



Fig. (14): C. Cerebralis cyst (arrow), in right parietal lobe) sheep brain

DISCUSSION

Coenurosis is a serious disease responsible for high economic losses in the sheep industry, in addition to its zoonotic impact. *Coenurus Cerebralis* considered as the principal cause for nervous manifestations of sheep and goats in Egypt, (Desouky *et al.*, 2011).

The overall prevalence of coenurosis in this study was (3.48%) as 26 generates sheep out of 747 total previously examined sheep, in Egypt, *Coenurus Cerebralis* intermediate stage of *T. Multiceps* infection was estimated at 18.3% in sheep flock from Suez Canal province (Desouky *et al.*, 2011, Anwar *et al.*, 2013) reported 100% prevalence in clinically diseased sheep from Cairo, although they did not find any cysts in the apparently healthy animals. Globally, different occurrences were recorded, 44.4% in Tanzania (Mira *et al.*, 2015), 100% and 2.7% from clinically diseased and apparently healthy sheep, respectively from 7.3% in Iraq (Karim 1979), Ethiopia (Achenef *et al.*, 1999), 3% in Jordon (Abo-Shehada *et al.*, 2002), 0.35% in Italy (Scala *et al.*, 2007), 15.5% in Turkey (Gicik *et al.*, 2007) and 18.7% in Iran (Tavassoli *et al.*, 2012), The variations in the prevalence in different geographical zones

might be attributed to the varied geographical, sociological and ecological factors (Sharma and Chauhan 2006).

The various nervous clinical signs of coenurosis were presented in varying degrees according to the affected site of the brain and site of the coenurus cyst either in the cerebrum or cerebellum, Table (2) and Figs. (2-14)., (Abo- Shehada *et al.*, 2002) the severity of clinical signs attributed to the inflammatory response of the animal, the site of the cyst, and the number of the ingested viable *T. Multiceps* eggs (Edwards, and Herbert, 1982).

Recognition of risk factors affecting the prevalence of coenurosis, the locality had a clear role as shown in Table (3) Belkas was the highest in frequency of coenurosis (42.33%), and Aga was the lowest (15.38%), A significant correlation was detected between prevalence of coenurosis and locality at P-value < 0.044, Table (5) this was due to the open borders of Belkas and availability to stray dogs, foxes, and in contact with other travelling flocks during feeding on the stumps of the crops after harvesting season.

The risk of sex on prevalence of coenurosis was noticed as females were higher in prevalence in comparison to males Table (3) as males usually kept for meat consumption only and usually sold for fattening while females always kept for breeding, the chance for a females to be infected by coenurosis is higher than males, this is in parallel with that of Karim (1979).

Age remains an important risk factor for coenurosis, as age group started from 4 months up to 1 year was the highest 42.33% Table (3) these results were in agreement with that of (Achenef *et al.*, 1999) who reported that susceptible age of sheep to coenurosis ranged from 6 to 24 months and (Abo- Shehada *et al.*, 2002) who reported a prevalence rate of 10% of coenurus cysts in the age group six months to 2.5 years.. While age group 0 - 3 months was 0.0% at this age had little chance of infection with coenurosis due to their feeding habits, the long incubation period and maternal immunity (Sharma and Chauhan 2006).

The rearing system as a risk factor for occurrence of coenurosis was clear in sheep reared outdoors was higher in prevalence of coenurosis than that kept indoors Table (3), there was a significant correlation between prevalence of coenurosis and rearing system, at a P - value < 0.019, Table (5), this due to the fact that outdoors, sheep were in contact with other infected flocks, stray dogs, contaminated pastures by the feces of dogs and other carnivores, also, a significant correlation was detected between prevalence of coenurosis and availability of dogs (present within the flocks or stray) & foxes at P-value <0.019 Table (5) in contact with sheep.

Prevalence of coenurosis within the cerebral cyst was higher (80.76%) than coenurosis within cerebellar cyst (19.23%), Table (3) this was in accordance with that of (Achenef *et al.*, 1999) as he reported 96% for cerebral coenurosis and 4% for cerebellar coenurosis. The relationship between the location of the coenurus cyst and the circling was clear as there was a highly significant difference in the distribution of cysts in wide circling and narrow circling. It was high in cerebrum in wide circling but it was high in cerebellum in case of narrow circling and no significant difference were detected in other signs due to the site of the cyst either in cerebrum or cerebellum. Table (4).

In this study, In spite of non significant correlation between prevalence of coenurosis, and disposal of offals of sheep to dogs, it is very important to put in mind that preventing offals of sheep to reach dogs or foxes is a critical point in preventing coenurosis in sheep specially when there is no, treatment regimens for dogs.

CONCLUSION

The rearing system, locality, age, sex of sheep, the presence of dogs specially none treated with contact

with sheep are considered as the major risk factors for occurrence of coenurosis in sheep flocks.

The clinical picture of the coenurosis manifested differently according to the site of the cyst (cerebrum or cerebellum) in the brain especially with the circling radius could help in predicting the location of the cyst from the clinical signs for further interference specially in case of valuable animals.

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AUTHOR'S CONTRIBUTION

Mohamed EL beskawy designed and carried out the wok, sample collection and wrote the article, Samar Atwa shared in sample collection and writing the article Emman Aboelfadl, carried out the statistical analysis, I., Abbas, diagnosed and identified the coenurus cyst, all authors wrote and approved the final manuscript.

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دراسة إكلينيكية وبعض الدراسات الوبائية وعوامل الخطر عن مرض السنيورس في الأغنام في محافظة الدقهلية- مصر

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أجريت هذه الدراسة على ٧٤٧ رأس من الأغنام في محافظة الدقهلية، منطقة الدلتا، مصر، على مدار عام ابتداء من مارس ٢٠١٤ وحتى فبراير ٢٠١٥ تم إجراء الصفة التشريحية للأغنام المريضة والتي أظهرت أعراضاً عصبية مختلفة. وتم أخذ العينات المخية لدراسة العوامل الإكلينيكية وعوامل الخطر وبعض أنماط وبائية مرض السنيورس في الأغنام حيث تم جمع عينات من ٤٣ خروف مريض من أربع تجمعات في محافظة الدقهلية. تم سرد الأعراض الإكلينيكية العصبية المختلفة لداء السنيورس بدرجات متفاوتة بالرجوع إلى الجانب المصاب من المخ والمخيخ والحبل الشوكي ومكان حويصلة السنيورس في الأجزاء سالفة الذكر. وكانت الأعراض الإكلينيكية ممثلة بالرأس المائلة ٤٢٪، حمل الرأس باتجاه الأجزاء الصلبة من البيئة المحيطة ٤٨٪، انخفاض الأذن ٤٩٪، الدوران ٧٠٪، العمى ١٦٪، الرقود ٣٠٪، والشلل الخلفي ١١.٥٣٪. أوضحت العلاقة بين موقع حويصلة السنيورس والأعراض الإكلينيكية حيث يمكن أن تساعد في التنبؤ بموقع حويصلة السنيورس من خلال الأعراض الإكلينيكية لمزيد من التدخل العلاجي خاصة في حالة الحيوانات ذات القيمة الاقتصادية العالية. تم الكشف عن وجود ارتباط كبير بين انتشار مرض السنيورس في الأغنام، ونظام التربية، مدى الاختلاط مع الكلاب والحيوانات البرية وخصوصاً الثعالب ومن خلال دراسة عوامل الخطر والأنماط الوبائية لمرض السنيورس في الأغنام لكي تتمكن من إجراء تطوير تدابير السيطرة على المرض في المستقبل.