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Studies on prevalence of metacestodiosis in caprines of Marathwada region of Maharashtra state

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Abstract
The present study was conducted in caprines of Marathwada region of Maharashtra state during November 2015 to August 2016. During study period, 280 goat carcasses slaughtered at different places and also goat carcasses presented to Department of Veterinary Pathology, College of Veterinary and Animal Sciences, Parbhani for conduct of post mortem were examined systematically and scientifically for presence of cyst/ metacestodes. The overall prevalence of metacestodeosis in slaughtered and died goats of Marathwada region was 42.14 percent. The male goats showed 42.55% whereas female goats were with 41.72% prevalence of metacestode infection. The incidence of cysticercosis recorded to the extent of 37.14% followed by mixed infection and hydatidosis up to 3.21% and 1.79% respectively. The omentum was most prominently infected organ with cysticercosis which accounts to 31.74% prevalence.

Keywords: Metacestodiosis, prevalence, cysticercosis, hydatidosis

Introduction
Goats called as poor man's cow. The India is second largest meat producer in the world sharing 10.41% goat meat production. Goats are raised principally for their meat, milk, fiber and skin.

The production and reproduction in goats can be achieved to their maximum potential only if equal attention is paid to their health through eradication or control of various diseases. Besides viral, bacterial and protozoan causes, a wide array of helminthes including those responsible for zoonosis cause heavy morbidity and mortalities in goats. The most important but unnoticed cause of economic losses in goats is parasitic infections of which different larval stages of taeniidae worms are most prominent. These are having zoonotic as well as economic importance due to condemnation of infected offal or meat [1]. Cestodes from *Taeniidae* family which infect dog (definitive host) are transmitted to a range of intermediate host species includes goats where they cause echinococcosis, cysticercosis or coenurosis [2].

Echinococcus granulosus is one of the most important zoonotic parasites of tropical and sub tropical countries. The adult parasite infect dogs and other canines, whereas, herbivorous and omnivorous animals serve as intermediate host. Food animal acquire the infection by ingestion of infective eggs with contaminated grass and water [3]. The global Hydatidosis infection prevalence rates reported were 22.98% in cattle, 10.58% in sheep, 12.03% in camels, 17.8% in equines and 1.88% in goats [4]. Another disease produced by Metacestode is *Coenurus cerebralis* caused by *Taenia multiceps*. It affect central nervous system of mainly sheep and goat known as "gid" or "sturdy". Cysticercosis is caused by *Cysticercus tenuicollis*, metacestode stage of *Taenia hydatigena.* This is disease of economic importance because intermediate host i.e. sheep and goats become infected by ingesting proglottids or eggs, passed in the faeces of the dog in pasture or feeding areas.

The present study was conducted with sole objective to note the prevalence of different metacestode infections in caprines of Marathwada region of Maharashtra state.

Materials and Methods
Duration and location of sampling
Study was conducted in slaughtered and died goats from Marathwada region during November 2015 to August 2016.

During study period, 280 goat carcasses slaughtered and died were examined for presence of cyst/ metacestodes. The eight districts of Marathwada region such as Aurangabad, Beed, Jalana, Latur, Nanded, Osmanabad, Hingoli and Parbhani were chosen for metacestode collection and for recording prevalence.

Sampling

After critical examination of goat carcasses, organs infected with metacestodes were collected as sample. Cysts were collected with the help of scalpel from different organs and were placed in specimen jar by adding 10% formaldehyde solution as a preservative. Jars were labeled with information such as date, host, species, age, organ and place.

Classification of data

On the basis of morphological features, location, in the tissue and number of scolices in the cyst observed, the type of metacestodes were identified and named. On the basis of types, the cysts were categorized as hydatid cyst, cysticercus and coenurus and concurrent infection of one or two types of metacestode as mixed infection. The data generated regarding prevalence of metacestodiosis were analyzed according to age and sex of host animal, type of metacestode, number of cyst(s) noted in individual animal and size of cyst and their distribution in different organ affected.

Statistical analysis

The data generated were analyzed statistically to find the level of significance by employing Chi-square test [16].

Results

After thorough post-mortem examination, the overall prevalence of metacestodeosis in caprines of Marathwada region was 42.14%.

The data generated when subjected for analysis revealed 88.88% prevalence of metacestodiosis in the goats ageing more than three years and it was 40.59% in goats ageing up to three years. Statistically, it was significant difference between two groups (Table 1).

Table 1: Age -wise prevalence of metacestodes in caprines of Marathwada region of Maharashtra state

Sr. No.	Age Groups of goats	Number of goats carcasses examined	Number of Positive cases	% Prevalence	Chi square value			Significance
					Calculated X^2	Table		
						1%	5%	
1	Up to 3 years	271	110	40.59	0.16	3.84	6.64	Significant
2	More than 3 years	9	8	88.88	4.68			
	Total	280	118	42.14%	4.84			

The data generated about age wise prevalence of different metacestode infection revealed 36.16% prevalence of *cysticercus* infection, Whereas, the this prevalence in the goats ageing more than three years was 66.66% which was non significantly higher. However, the prevalence of hydatid cysts was non-significant. The percent prevalence of hydatidosis in goats ageing up to three years was 1.11% and that of goats ageing more than three years was highly significant (22.22%). The percent prevalence of mixed infection of metacestode was only observed in goats ageing up to three years (3.22%). The results are summarized in Table 2.

Table 2: Age-wise prevalence of different Metacestodes infection in Caprines of Marathwada region of Maharashtra state

Sr. No	Type	Goats ageing Up to 3 year			Goats ageing above 3 year			Chi square value			Significance
									Table		
		Number of goats carcasses examined	Number of positive goats	Percentage	Number of animals screened	Number of positive animals	Percentage	Calculated X^2	1%	5%	
1	Cysticercus	271	98	36.16	9	6	66.66	1.80	6.25	7.82	Non-significant
2	Hydatid		3	1.11		2	22.22	110.54			Highly-significant
3	Mixed infection		9	3.32		0	00	92.74			Highly-significant
	Total	271	110	40.59	9	8	88.88				

The male goats showed 42.55% prevalence, whereas, female goats were with 41.72% prevalence of metacestodiosis infection. These percent prevalence values were statistically non-significant.

Table 3 depicts sex wise prevalence of different metacestode infection in caprines of Marathwada region. There was high prevalence of cysticercosis followed by hydatidosis and mixed infection in male goats, whereas, in female goats, extent of prevalence was higher of cysticercus followed by mixed infection and hydatidosis. However, the infection of cysticercosis was statistically non-significant. Whereas, hydatidosis and mixed infection was highly significant amongst male and female population.

Table 3: Sex-wise prevalence of metacestode infection in Caprines of Marathwada region of Maharashtra state

Sr. No.	Type	No. Male Inspected	Male	percentage	No. Female Inspected	Female	percentage	Chi - square			Significance
								Calculated X^2	Table		
									1%	5%	
1	Cysticercus	141	57	40.42	139	47	33.81	2.23	9.21	5.99	Non-significant
2	Hydatid		2	1.42		3	2.16	108.21			Highly-significant
3	Mixed		1	0.71		8	5.76	62.32			Highly-significant
	Total	141	60	42.55	139	58	41.73				

Prevalence according to type of metacestode

The data when screened for noting percent prevalence of type of metacestode infection, cysticercosis was to an extent of 37.14% followed by mixed infection of 3.21% and hydatidosis to an extent of 1.79%. The percent prevalence of cysticercosis was highly significant than other type of infection as shown in Table 4.

Table 4: Prevalence of different metacestodes in caprines of Marathwada region of Maharashtra state

Sr. No.	Type	No. Animals Inspected	Number of Animals Positive	Percentage	Chi. Square			Significance
					Calculated X^2	Table		
						1%	5%	
1	Cysticercus	280	104	37.14	1.66	6.25	7.82	Highly-significant
2	Hydatid		5	1.79	108.21			
3	Mixed infection		9	3.21	100.68			
	Total	280	118	42.14	210.55			

Prevalence according to organ

The metacestode infection was significantly higher in the omentum (32.82%) as compared with other infected organs (Table 5).

Table 5: Organ wise prevalence of metacestodes in caprines of Marathwada Region of Maharashtra state

Sr. No.	Organs	Number of Animal Screened	Positive	Percentage	Chi square			NS/S/HS
					Calculated X^2	Table		
						1%	5%	
1	Omentum	280	92	32.85	15.33	20.09	15.51	Highly -Significant
2	Liver		12	4.28	115.04			
3	Muscles		9	3.21	120.58			
4	Lung		2	0.71	134.02			
5	Mesentry		10	3.57	118.72			
6	Rumen		5	1.78	128.18			
7	Wall Of Intestine		7	2.49	124.36			
8	Gall bladder		1	0.35	136.01			
	Total	280	138*		892.24			

* The number of positive cases in present table is higher than number of positive cases shown in table 6 as it includes multiple cysts.

The omentum was most prominently infected organ with cysticercosis as evidenced with 31.74% prevalence (Table 6). The prevalence of hydatidosis was noted in various organs such as omentum, liver and muscles of different region of body to an extent of 2.14%, 1.43% and 0.71% respectively. The percent prevalence for coenurosis recorded in liver and omentum were 0.71% and 0.36 % respectively.

Table 6: Organ wise prevalence of different metacestodes in caprines of Maharashtra state

Sr. No.	Organ involved	Cysticercosis		Hydatidosis		Coenuruses	
		Number of positive animals	Percentage	Number of positive animals	Percentage	Number of positive animals	percentage
1	Omentum	89	31.76	2	00.71	1	00.36
2	Liver	6	02.14	4	01.43	2	00.71
3	Muscle	3	01.07	6	02.14	0	0
4	Mesentery	10	03.57	0	0	0	0
5	Rumen	5	01.79	0	0	0	0
6	Intestine	7	02.50	0	0	0	0
7	Lung	2	00.71	0	0	0	0
8	Gall bladder	1	00.36	0	0	0	0

The number of cysts noted in positive cases of metacestode infection were in the range of 1 to 9 cysts per animal. Most frequent finding was single cyst per animal.

The average size of cysticercus cyst was 17.96 ± 0.66 mm, that of hydatid cyst, the average size was found to be 35.50 ± 8.38 mm with the range of 10 mm to 70.50 mm. The average

size of coenurus cyst was 5.57 ± 2.01 mm with the range of 3-10.5mm.

Discussion

The high prevalence of metacestodiosis in goats ageing up to 3 years noted in present study could be attributed to the usual trends of slaughtering age for getting optimum output. As per United States Department of Agriculture, Food Safety and Inspection Service, Kids (goats under a year of age) are often slaughtered when 3 to 5 months of age and those attaining 25 to 50 pounds weight. The less number of goats ageing more than 3 years were screened in present study could be reason for getting nil percentage of mixed infection in goats. There was no impact of age on the prevalence of *Cysticercus tenuicollis* in sheep and goats. Similar observations in regards to age have been noted by various researchers [5-7].

In present study, the pattern of prevalence of mixed infection was similar to that of hydatidosis, showing high prevalence in female goats as compared to males. This could be possibly due to productive and reproductive stress allowing animal to compromise to infection and also exposure to infection for longer period.

The earlier reports shows high prevalence of cysticercus cysts in older females as compared to young male goats indicating a significant influence of age and sex on rate of infection [12] . In present study, the prevalence of hydatidosis was noted more in female goats as compared to male goats. These results of present study are in close approximation with the findings of earlier researchers [8-10].

The present observations in respect of percent prevalence of type of metacestodes are in consonance with other researchers [11-15]. The considerable prevalence of cysticercosis in goats could be very well explained on the basis of grazing pattern in Marathwada region. Mostly the goats are reared in rural areas and are generally managed on scavenger feed and fallen leaves of perennial trees and nuts of many plants. These are also allowed to feed on road sides and non-cropping lands which could make the goats accessible for contracting the infection.

There were vast variations regarding results of prevalence of metacestode infection in caprines. The probable reasons for these facts could be different geographical areas of study, management of farm animals, improper disposal of carcasses, fallen animals, contamination of water and pasture due to presence of stray dog population and disposal methods of slaughter house waste material. Due to these predisposing factors, researchers might have observed variability in prevalence of metacestode infection in goats.

The number of cysts in metacestodiosis could be dependent of exposure to infection, duration, immune profile of exposed animal and management practices being adopted.

Conclusion

The overall prevalence of metacestodiosis in screened caprines of Marathwada region was 42.14%. Amongst various types of metacestode infections, cysticercosis ranked first followed by mixed infection and hydatidosis. The prevalence of metacestodiosis in goats found to be increased with the advancement of age. The metacestode infection in goats was predominantly observed in omentum, followed by liver, mesentery, muscles, intestine, rumen, lung and gall bladder as evidenced by varying sized cysts in respective organs.

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