



E-ISSN: 2320-7078

P-ISSN: 2349-6800

www.entomoljournal.com

JEZS 2020; 8(4): 58-63

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Received: 10-05-2020

Accepted: 12-06-2020

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Prevalence and description of hydatidosis in slaughtered sheep of Jammu region

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Abstract

In order to have a definite occurrence pattern of hydatidosis among sheeps of Jammu region a retrospective examination of all visceral organs was conducted with a sample size of 1000 sheep at an organized municipal slaughter house of Jammu region. A total of 64 sheep were positive for hydatidosis with overall prevalence of 6.4 per cent. Lungs and liver were found to be most common predilection sites for the hydatidosis with figures 43.75% and 39.06%, respectively. Cysts of different types viz., viable, non-viable, sterile and calcified were having prevalence of 64.70%, 35.29%, 63.33% and 36.66% respectively with overall fertility rate as 53.12%. The size of the cyst being another stricture to categories the cysts which were of small size viz., 24 (22.64%) in lung and 31 (29.24%) in liver while as 39 (36.78%) in lungs and 12 (11.32%) in liver were of medium size.

Keywords: Calcification, cysts, hydatidosis, prevalence, slaughter

Introduction

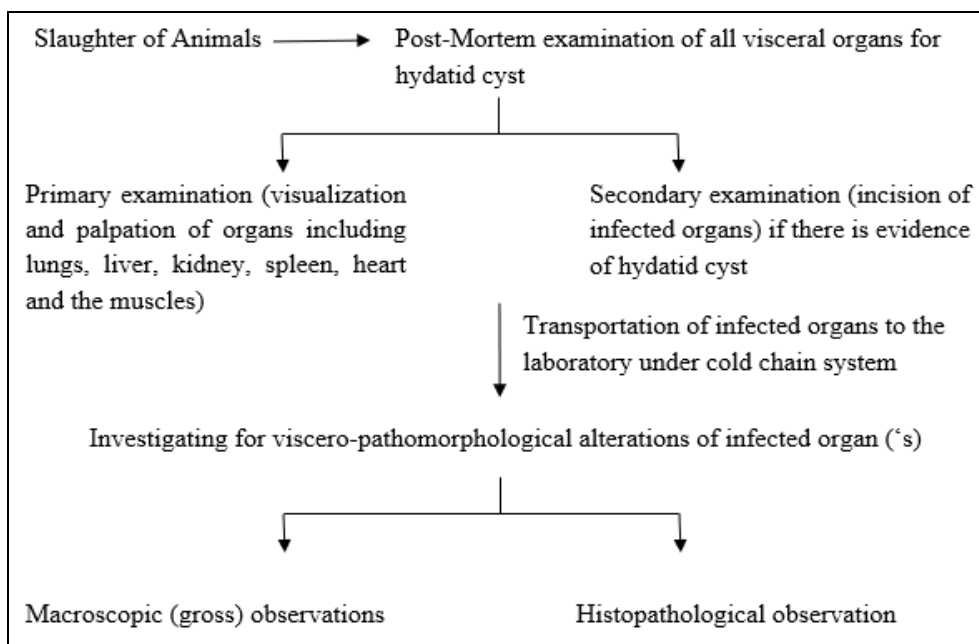
Hydatidosis is a zoonotic disease caused by tapeworm *Echinococcus granulosus*. The parasite is of great economic implication imparting production losses as \$125,000 billion (US dollars) annually in intermediate (domestic animals) and health hazard in aberrant intermediate hosts (humans) [1, 8, 11, 19]. India has got idyllic conditions for the development and transmission of hydatidosis in both livestock and humans since unhygienic slaughtering of food animals and free access of dogs and other canids to slaughter houses allows in the life cycle completion of parasite. Other possible cause for disease transmission encountered in India and other southern parts of Asia is irrigation of vegetables with contaminated water and soiling of vegetables by definitive hosts viz., dogs and wild carnivores. The fertility of hydatid cysts befalling in various intermediate host species is one of the most imperative factor in the epidemiology of the disease, depending on the distribution pattern [5]. In Jammu, very scarce studies have been conducted about hydatidosis. The purpose of this study was to determine the prevalence and the fertility/sterility rate of hydatidosis in sheep slaughtered at organised municipal slaughter houses of Jammu region.

Material and Methods

The study was conducted on sheep slaughtered at organized slaughter house (Gujjar Nagar and Dogra hall) of Jammu region with a sample size of 1000 (selected randomly).

Data collection procedure

The various procedures can be summarised in the below given flowchart.



Cyst characterization and body condition scoring associated with hydatid cyst count

Once the infected organs were transported to the laboratory, cysts were counted and their size was measured using measuring scale. The size of the collected hydatid cyst was measured and classified on the basis of diameter of individual cyst as small (<4 cm), medium (4 -8 cm) and large (> 8 cm)

as per standard method [17]. Volume and viability of cyst were also recorded.

To connote the relationship of cyst count and body condition score, body condition scores of animals were classified into three categories as lean (score 1, 2, 3), medium (score 4, 5, 6) and fat (score 7, 8, 9) [10]. Body condition scores was done prior to slaughter of the animals as depicted in Table 1.

Table 1: Description of condition scores

Score	Condition	Features
1	L-	Marked Emaciation.
2	L	Transverse processes project prominently, neural spines appear sharply.
3	L+	Individual dorsal spines are pointed to the touch; hips, pins, tail head and ribs are prominent. Transverse processes visible, usually individual.
4	M-	Ribs, hips and pins clearly visible. Muscle mass between hooks and pins slightly concave. Slightly more flesh above the transverse processes than in L+.
5	M	Ribs usually visible, little fat cover, dorsal spines barely visible.
6	M+	Animal smooth and well covered; dorsal spines cannot be seen, but are easily felt.
7	F-	Animal smooth and well covered, but fat deposits are not marked. Dorsal spines can be felt with firm pressure, but feel rounded rather than sharp.
8	F	Fat cover in critical areas can be easily seen and felt; transverse processes cannot be seen or felt.
9	F+	Heavy deposits of fat clearly visible on tail-head, brisket and cod; dorsal spines, ribs, hooks and pins fully covered and cannot be felt even with firm pressure.

Viability of cysts

The surface of the cyst was sterilized by alcoholic-iodine solution to reduce intracystic pressure and then the cyst wall was penetrated using a large size needle and incised with scalpel and blade, after that the content was transferred into sterile container and examined microscopically (10X) for the presence of fertile and infertile cysts. Individual cysts were carefully incised and examined for protoscolices (white dots on the germinal epithelium; such cysts were characterized as fertile cysts as shown in Fig.1). Fertile cysts were further subjected for viability test for classification as viable (live) and non-viable (dead cyst). To check the viability, a drop of 0.1% aqueous eosin solution was added to equal volume of hydatid fluid having protoscolices on a microscopic slide with the principle that live protoscolices should completely or partially exclude the dye while the dead ones take it up as shown in Fig.2 as per the customary procedure [9]. Furthermore, infertile hydatid cysts were classified as sterile or calcified by their smooth inner lining usually with slight

turbid fluid in its content. Typical calcified cysts produce a gritty sound feeling upon incision [13, 18].



Fig 1: Depicting fertile cyst having protoscolices containing food vacoules (X10)

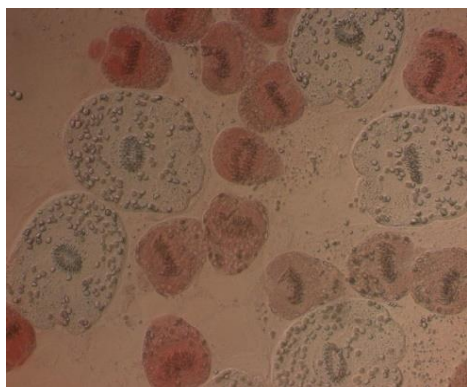


Fig 2: Depicting live protoscolices without eosin dye and dead ones are taking colour (X40)

The overall prevalence of hydatidosis was found to be 6.4 per cent. The involvement of lungs and liver accounted for 43.75 and 39.06 percent, respectively, whereas 11 (17.18%) out of 64 positive cases have cysts both in liver and lungs. No cysts were found in Heart, Kidney and Spleen. The organ wise involvement of hydatidosis is described in Table.2. The

Table 2: Organ wise involvement of hydatidosis in sheep

Organ	Infected	Prevalance (%)
Lungs	28	43.75 (%)
Liver	25	39.06 (%)
Lungs and Liver both	11	17.18 (%)
Total (n=1000)	64	6.4 (%)

The total cyst counts with respect to size in each affected organ for sheep recorded is shown in Table.3. Among 106 cysts collected, 55 were having diameter less than 4cm and carried less than 15ml cystic fluid, the remaining 51 cysts were of 4-8 cm in diameter with 15-20 ml of cystic fluid. No cysts were found having diameter more than 8 cm. 63 cysts were collected from lungs with average intensity per organ 1.61, appraisal to which 43 cysts were collected from liver with average intensity per organ was 1.19. Lungs have more number of medium sized (39) cysts whereas liver had more number of small sized (31) cysts with prevalence rate of 36.79 and 29.24 per cent, respectively. The reason for high percentage of medium cysts in the lung is due to soft

present observations are attuned with that of previous studies, who found hydatidosis in 5.6 per cent out of 1141 sheep examined in Chennai with percentage of hydatid cysts in lungs and liver were observed as 51.56 per cent and 45.31 per cent, respectively and is in connation with other studies who too reported hydatid cyst count was highest in the lungs followed by liver, kidney, spleen and heart [6, 16]. In the present study, the most frequently infected organ was lung followed by liver, this might be due to the reason that the large capillary fields are first to be encountered by the blood born oncospheres thus the presence of greater capillary beds in lungs than the other organs, and soft consistency of the lung might also allow easy growth of cysts. The development of hydatid cyst occurs occasionally in other organs and tissues when oncosphere escape into the general systemic circulation [20]. In addition to this, the present study is braced by the studies conducted in sheep one in Andhra Pradesh and another in Jammu itself who reported 7.05 per cent prevalence of hydatid cyst in sheep and 6.82 per cent prevalence of hydatid cyst in lungs and liver of small ruminants slaughtered in abattoir of Jammu, respectively [4, 7].

consistency of the lung while the higher number of small and calcified cysts in the liver could be indorsed to relatively higher reticuloendothelial cells and copious connective tissue reaction of the organ. More number of small cysts may specify late infection of the animals and due to immunological response of the host which might preclude expansion of cyst size [19]. The present study revealed overall prevalence of small cysts (51.88%) slightly more than medium cysts (48.11%), which is in accordance with the findings of other studies conducted, who also reported high percentage of small cysts than medium cysts in liver and lungs respectively in sheep slaughtered at Ethiopia [2, 3].

Table 3: Cyst size and counts in relation with organ involvement in sheep

Organ infected	Cyst size (in cm)				Average intensity of cysts per organ
	Small (0-4)	Medium (4-8)	Large (>8)	Total	
Lungs (n=39)	24 (22.64%)	39 (36.79%)	--	63	1.61
Liver (n=36)	31 (29.24%)	12 (11.32%)	--	43	1.19
Total	55 (51.88%)	51 (48.11%)	--	106	1.65

In this study, an assessment was made to establish relationship between body condition scores and hydatid cyst count. Out of 64 positive cases 48 sheep (75.00%) were observed to be having poor body condition score (lean) with higher number of hydatid cyst count of 81 as shown in Table.4. which emphasizes on the fact that the poor condition among animals is probably a reflection of the effect of relatively high cyst burden. 14 sheep (21.83%) were having medium body condition score with hydatid cyst count of 23

and there were only 02 sheep (03.12%) with higher fat content having hydatid cyst count of 02. In moderate to severe infection, the parasite may cause retarded performance and growth, reduced quality of meat as well as weight loss [14]. The present exploration is in line with other studies, who reported animals with poor body condition slaughtered at abattoir in Ethiopia were found to have higher hydatid cyst count [2].

Table.4. Body condition scoring associated with hydatid cyst count in sheep

Body condition	Score	Category	Animals positive	Cyst count		Total
				Lungs	Liver	
Lean	1	(L-)	22	24	14	38
	2	(L)	17	16	12	28
	3	(L+)	09	07	08	15
	Total		48 (75.00%)	47	34	81
Medium	4	(M-)	06	08	02	10
	5	(M)	04	01	05	06
	6	(M+)	04	06	01	07
	Total		14 (21.87%)	15	08	23
Fat	7	(F-)	01	01	00	01
	8	(F)	01	00	01	01
	9	(F+)	00	00	00	00
	Total		02 (03.12%)	01	01	02
Grand Total			64	63	43	106

The percentage of fertile and infertile cysts in sheep were found to be 53.12 and 46.87 per cent respectively (Table 5), the fertility of hydatid cysts varies depending on intermediate host species and geographical areas [15]. Observations from Ethiopia who reported the percentage of fertile and infertile cysts in sheep were found to be 59.42 and 40.57 per cent and that from Egypt reported the percentage of fertile cysts in sheep were found to be 62.16 per cent, which are both in parity with present study [2, 12]. This possibly emphasizes the role of sheep in the occurrence of hydatidosis and the difference in fertility and proportion viable protoscolices from

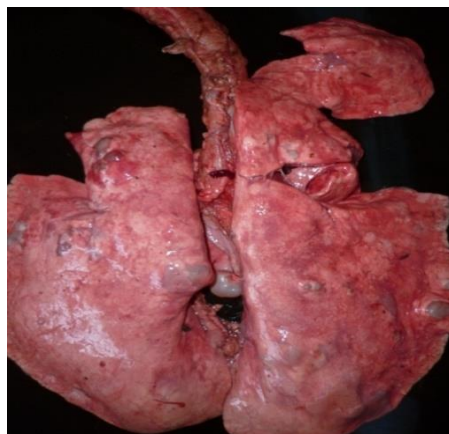
fertile cyst may be related to the difference in immunological response in each host. Moreover, the fertility of hydatid cyst in the intermediate host may be also genotype dependent. This variation could be attributed to strain differences in traits such as host preference, development rate, infectivity, pathogenesis, antigenicity and drug resistance. Moreover, it has been specified that ovine strain of *Echinococcus granulosus* imposes tremendous effect on the health hazard in respect to human population and the presence of fertile cysts on cattle of an apparent ovine strain may constitute an additional public health problem.

Table 5: No. of animals having fertile (viable and nonviable) and infertile (sterile and calcified) hydatid cyst

Fertile		Infertile	
Viable/live cyst	22 (64.70%)	Sterile cyst	19 (63.33%)
Nonviable/dead cyst	12 (35.29%)	Calcified cyst	11 (36.66%)
Total (n=64)	34 (53.12%)	Total	30 (46.87%)

Viability and non-viability of cysts was found to be 64.70 and 35.29 per cent respectively, whereas prevalence of sterile and calcified cysts were 63.33 and 36.66 per cent respectively. The present study is in similar line with the results reported previously [8, 21]. The previously stated prevalence of sterile and calcified cysts in sheep of Jammu were 70.00 and 30.00 per cent, respectively thus virtual to present work [7]. All the infected visceral organs of each of the studied sheep were subjected to observation of macroscopic changes due to the presence of hydatidosis. Amongst the different visceral organs examined, gross changes were seen only in lungs and liver due to hydatid cyst with one or more cysts as shown in

Fig.3 and Fig.4. Both the lungs and liver were enlarged, congested, firm and having hard fibrous consistency with large hemorrhagic patches scattered over the parietal surface in respect of lungs and ventral aspect in case of liver. Histopathological examination of lungs revealed fibrous connective tissue proliferation and necrosed areas in lung parenchyma with intact lung alveoli whereas liver showed necrosed mass of hepatocytes surrounded by fibrous connective tissues infiltrated with mononuclear cells and eosinophils as shown in Fig. 5 and Fig. 6. Portal area of liver also showed bile duct hyperplasia with severe hemorrhages.

**Fig 3:** Depicting firm, enlarged lungs with small cysts attached within the parenchyma and large haemorrhagic patches scattered over the parietal surface

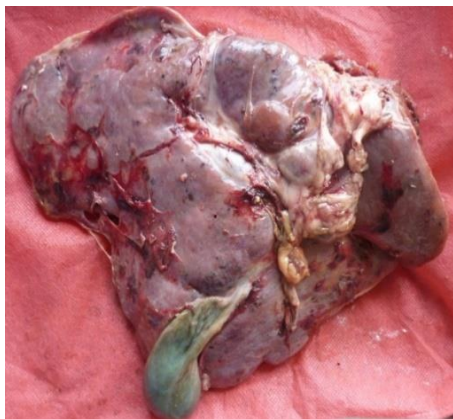


Fig 4: Depicting firm, enlarged liver with congestion and hard fibrous tissue

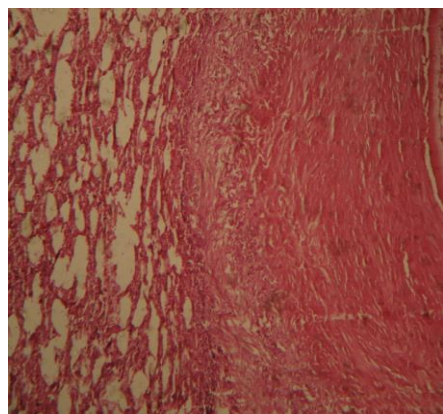


Fig 5: Depicting fibrous connective tissue proliferation with intact lung alveoli on left side

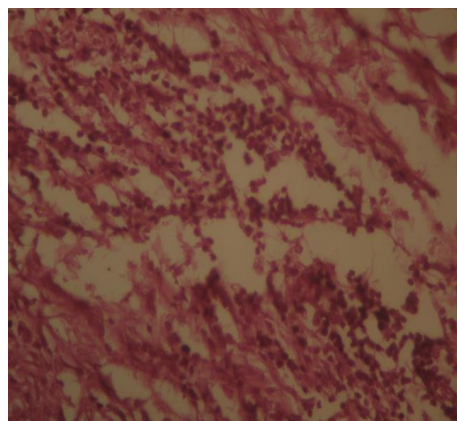


Fig 6: Hepatocytes surrounded by fibrous connective tissue infiltrated with mononuclear cells and eosinophils in liver

Conclusions

Lung was found to be more infected organ than liver. Furthermore, among the positive animals, the occurrence of the hydatid cyst varies in size and volume. Poor condition among animals is probably due to the effect of relatively high cyst burden. Data on the fertility of cysts in sheep provide reliable indications of the importance of species as a potential source of infections in dogs. Public awareness should be created about the transmission and the life cycle of hydatid cysts and stray dog population should be properly managed. Promoting the establishment of intensive farms should be encouraged, since the management system practiced in the region is one factor in predisposing small ruminants to hydatidosis.

Acknowledgements

The authors are thankful to Division of Veterinary Medicine, Faculty of Veterinary and Animal Science SKUAST-J, R.S. Pura, Jammu for providing necessary research facilities.

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