



## Original Article

## Prevalence of ovine cystic echinococcosis in Kashmir Valley, North India



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## ABSTRACT

A total of 1455 local and non-local (originating from other Indian states), slaughtered or spontaneously dead, sheep in various areas of Kashmir Valley were investigated for the presence of cystic echinococcosis over a period of one year. The overall prevalence was 7.97% with higher prevalence in local (14.3%) than in non-local sheep (6.06%). The prevalence of infection, total number of cysts recovered and mean intensity of infection were higher in lungs as 66.2%, 506 & 5.1% respectively, followed by liver (28.5%, 169, 3.9%) and spleen (5.3%, 9, 1.13%). Either single (71.55%) or multiple (28.45%) organ involvements were observed. 66.6% of cysts were of small size, 19.29% medium, 7.01% large and 7.01% calcified. The fertility of cysts was noted to be 65.7% whereas 34.2% were infertile which included 27.1% sterile and 7.01% calcified cysts. The viability percentage of protoscolices from all the fertile cysts was 74.2%. The number of cysts recovered was higher in sheep with body condition score- emaciated, thin and average, and lower in, fat and obese. The study showed that the local sheep were more vulnerable to contract cystic echinococcosis than non-local sheep which is further aggravated by poor body condition.

## 1. Introduction

Cystic echinococcosis (CE) has been recognized as one of the most important parasitic problems in man and livestock (Singh et al., 1988) resulting in significant production losses in livestock (Galassi and Mazzini, 1985; Torgerson, 2003) as well as human complications. In India, the endemic nature of cystic echinococcosis was reported by Mapleston (1933) and Sami (1938). CE is one of the most common helminthic diseases of the animals (Ahmadi and Meshkekar, 2011) and ranks first in the slaughtered animals in India (Das et al., 2003). It is caused by the metacestodal stage of *Echinococcus granulosus*. The mature tape worm is found in the small intestine of carnivores particularly in dogs and the metacestode is found in a wide variety of ungulates and humans (Verma et al., 1994). In intermediate hosts, the cysts are commonly found in liver, lungs, spleen and very rarely in the muscles (Sangaran and Lalitha, 2009). Cystic echinococcosis is recognized as being one of the world's major zoonosis (Eckert and Deplazes, 2004). Because of an extensive distribution throughout the world, it gets such a significant attention that prevention of this disease is one of the dynamic programmes of the World Health Organisation (WHO, 1982). The zoonotic disease, CE, has been placed on the Neglected Tropical Disease (NTD) list of the WHO/Tropical Disease

Research (TDR) (Carmena and Cardona, 2014).

The absence of proper meat inspection procedures and the presence of huge stray dog population are thought to contribute significantly to the prevalence of the disease. Although, humans acquire infection from canines, its occurrence in sheep directly reflects the endemicity and levels of human risk. Godara et al. (2014) reported 19.8% prevalence of hydatidosis in goats of Jammu and Qazi et al. (2011) reported occurrence of hydatid cyst in thigh muscles of a goat in Kashmir Valley. According to the importance of the disease and scarce data available with regard to its status and nature in sheep in Kashmir Valley, the present investigation was carried out to determine the prevalence of cystic echinococcosis in sheep in Kashmir Valley.

## 2. Materials and methods

## 2.1. Study area and animals under study

The study was conducted on local (born and reared in Valley) and non-local (born and reared in other Indian states and then brought to Valley for mutton purpose) sheep, including both slaughtered and spontaneously dead, from local sheep farms, postmortem hall of the University, local abattoirs and local butchers of different regions of

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Fig. 1. Map of Kashmir Valley depicting sampling areas. Retrieved from Google Images.

Kashmir Valley over a period of one year. The study area was divided into three zones viz.: Northern region which includes Kupwara, Baramulla and Bandipora Districts, Central region which includes Ganderbal, Srinagar and Budgam Districts and Southern region which includes Pulwama, Shopian, Kulgam and Anantnag Districts of Kashmir Valley (Fig. 1). A total of 1455 sheep comprising of 419, 624 and 412 from each zone, respectively, were screened. The sheep were mostly > 1.5 years of age (1087) and of female sex (988) while the rest of the sheep were < 1.5 years and of male sex. Age of the sheep was determined by dentition. The animal under study was given an identification number and its age, sex, breed and origin were recorded. During examination of the carcass, the body condition was recorded into five categories as emaciated (condition 1), thin (condition 2), average (condition 3), fat (condition 4) and obese (condition 5) in accordance with the score card given by Thompson and Meyer (1994).

2.2. Parasitological examination

Thorough *in situ* and *ex situ* examination of different organs was done for presence of cysts. Lung, liver, spleen, kidney, heart and muscles were examined by visual inspection, palpation and additionally giving one or more incisions in order to confirm presence of small or embedded cysts. The infected organs from each positive animal were collected for laboratory investigations. The total number of cysts were counted organ-wise and recorded. The size of cyst was measured and classified as small (diameter < 5 cm), medium (diameter between 5 cm and 10 cm) and large (diameter > 10 cm) in accordance with Oostburg et al. (2000).

Table 1  
Prevalence of cystic echinococcosis in sheep in Kashmir Valley.

Sheep	Northern zone		Central zone		Southern Zone		Total	
	No. screened	No. + ve	No. screened	No. + ve	No. screened	No. + ve	No. screened	No. + ve
Local	109	13(11.9%)	136	21(15.4%)	89	14(15.7%)	334	48(14.3%)
Non-local	310	21(6.7%)	488	28(5.7%)	323	19(5.8%)	1121	68(6.06%)
χ <sup>2</sup> value	–	2.87	–	13.84***	–	9.18**	–	24.19***
Total	419	34(8.11%)	624	49(7.8%)	412	33(8.00%)	1455	116(7.97%)

\*\* p < 0.01.  
\*\*\* p < 0.001.

Individual cysts were carefully incised and fluid collected in a sterile container. The cysts were characterized as fertile or sterile on the basis of presence or absence of protoscolices on the germinal epithelium, and supplemented by examining and then centrifuging the cyst fluid for viewing the sediment under light microscope. The sediment was additionally viewed under phase contrast microscope for examination of protoscolices. Fertile cysts were subjected to viability test. Viability test for fertile cysts was done by observing amoeboid like peristaltic movements of protoscolices under microscope, under 40 × objective and by dye exclusion test using 0.1% aqueous eosin. In this method, 0.1% aqueous eosin solution was added to equal volume of protoscolices in cystic fluid on microscope slide with the principle that viable protoscolices should completely or partially exclude the dye while the dead ones take it up (Macpherson et al., 1985). Infertile cysts were further classified as sterile or calcified (Soulsby, 1982).

2.3. Statistical analysis

Data related to different parameters were compiled, tabulated for frequency and then converted into percentage to draw inferences. Chi-square test was employed for analysis of the data as per standard statistical procedures of Snedecor and Cochran (1994). The analysis was considered as statistically significant if ‘p’ ≤ 0.05. Statistical analysis was done using SPSS 16 version.

3. Results

Total 116 sheep revealed one or more cysts in various organs out of 1455 sheep examined, giving an overall prevalence of 7.97%. Although the rates of infection in the three zones were relatively similar, the highest rate of infection was found in Northern zone followed by Southern zone and lowest in Central zone. Although prevalence did not differ statistically between local and non-local in North-zone, it differed statistically in Central and Southern zone. The overall prevalence observed was significantly (p ≤ 0.001) higher among local sheep when compared with non-local sheep (Table 1).

A total of 151 organs, including lung, liver and spleen, from 116 affected sheep showed presence of cysts. Out of the total infected organs, the involvement of the lung and liver accounted for 94.69%. The lungs were observed to be the most frequently infected organ with relative prevalence of 66.22% (100/151) followed by liver and spleen. A total of 684 cysts were recovered from different organs. Highest number was found in lung followed by liver and spleen. The mean intensity of infection was also highest in lung (5.06 cysts/organ) followed by liver and spleen. However, the number of cysts recovered from any single organ specimen was highest in liver (36 cysts) followed by lung and spleen (Table 2).

Single and multiple infections of organs were recorded during the study. Single organ involvement was observed in 71.55% (83 positive cases) sheep harbouring cysts with 59.4% (69 positive cases), 10.4% (12 positive cases) and 1.7% (2 positive cases) infection rate in lungs, liver and spleen, respectively. The remaining 28.42% had a multiple organ involvement which includes lung & liver (22.4%, 26 positive

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