



# A study on the prevalence of echinococcosis in stray dogs of the Kashmir valley

 Abas Andrabi<sup>1</sup>,  Hidayatullah Tak<sup>1</sup>, Ishfaq Majeed Malik<sup>1</sup>,  
Wasim Muzamil Dass<sup>1</sup>, Abid Hussain Bhat<sup>1</sup> and Bilal Ahmad Para<sup>2</sup>  
Parasitology Laboratory, Department of Zoology,  
University of Kashmir, Srinagar, 190006, J&K, India.  
Department of Mathematical Sciences,  
Islamic University of Science and Technology, Kashmir.

Citation: Abas, A., Ishfaq, M.M., Hidayatullah, T., Wasim, M.D., Abid, H.B. and Bilal, A.P. 2022. A study on the prevalence of Echinococcosis in stray dogs of Kashmir valley. *J. Vet. Anim. Sci.* 53(3): 503-508  
DOI: <https://doi.org/10.51966/jvas.2022.53.3.503-508>

Received: 25.01.2022

Accepted: 22.04.2022

Published: 30.09.2022

## Abstract

*Echinococcus granulosus* is known to cause echinococcosis in dogs and hydatid disease or cystic echinococcosis in ruminant animals and accidentally in humans. Dogs have a crucial role in the transmission of zoonotic parasites in the Kashmir valley, as they frequently come into touch with humans. Cysts developed as a result of this condition are diagnosed using a variety of procedures, including computed tomography, ultrasonography, and magnetic resonance imaging (MRI). The adoption of contemporary immunodiagnostic techniques, on the other hand, has improved the diagnosis of intestinal echinococcosis on a larger scale, allowing epidemiological studies to be conducted on a larger number of people. In the present study, the prevalence of echinococcosis infection in dogs was determined by examining faecal samples collected from different districts of the Kashmir Valley. An immunodiagnostic test, sandwich ELISA, was used for coproantigen detection of *Echinococcus granulosus* infection in dogs. A total of 476 faecal samples were tested, out of which, 48 samples were found to be positive in sandwich ELISA, which were mostly collected from different districts of the Kashmir valley and the collection sites included streets, playgrounds, open fields, parks, etc. of the Kashmir valley.

**Keywords:** Zoonosis; prevalence; sandwich ELISA; coproantigen

Echinococcosis is a widespread dreadful parasitic disease with high zoonotic potential that has major medical and socio-economic costs for human beings and is also a great threat to livestock productivity (Battelli, 2009; Budke *et al.*, 2006). The highest prevalence of echinococcosis in India has been reported in two states viz. Andhra Pradesh and Tamil Nadu when compared to other parts of the country, (Nepalia *et al.*, 2006).

1. Ph.D. Scholar

2. Associate Professor, Department of Zoology

\* Corresponding author email id: [abbas.andrabi@gmail.com](mailto:abbas.andrabi@gmail.com), Ph: 9149570106

Copyright: © 2022 Abas *et al.* This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Hospital-based studies and numerous other reports on this infection are also available from Srinagar, Kashmir (Chisti *et al.*,2000; Fomda *et al.*,2015; Fomda *et al.*,2002). However, in the Kashmir valley, adequate information on the incidence level and the prevalence of echinococcosis infection of dogs is not yet available. Accurate diagnosis of echinococcosis in definitive hosts (dogs) for controlling livestock and human losses due to this infection has always been an important factor for establishing parameters for the epidemiological study of echinococcosis (Sakai, 1996). Routine coprological techniques cannot differentiate the *Echinococcus* eggs from those of *Taenia* species due to morphologic similarity (Dinkel *et al.*,1998). The most extensively used diagnostic methods in dogs are purgation with arecoline compounds and examination of the small intestine after necropsy (Unruh *et al.*,1973; Craig *et al.*,1995). Though necropsy is considered as the gold standard, this method has its limitations (Jenkins *et al.*,2000; Lopera *et al.*, 2003). Alternatively, immunodiagnostic techniques for detecting specific antigens or antibodies have recently been used. During the last few decades, several serological and immunological tests have been introduced for the diagnosis of *Echinococcus* spp. in definitive hosts (dogs). The enzyme-linked immunosorbent assay (ELISA) used for the detection of *Echinococcus* specific coproantigens has been considered as a novel approach for diagnosis of intestinal echinococcosis infection and this method has already proved its value for the diagnosis of infection both in live and dead animals (Deplazes *et al.*,2003). Parasite-specific antigen detection in host faeces was first reported for canine *Echinococcus granulosus* by Babos and Nemeth (1962). Coproantigen tests or arecoline tests with rectal faecal samples of dog provided the information on individual prevalence, while the use of ground collected faecal samples is of greater epidemiological value for the detection of coproantigens in the faeces (Cavagion *et al.*,2005).

The objective of the present work was to establish the prevalence of *Echinococcus granulosus* in dogs of Kashmir valley by using a Copro-ELISA technique which is considered as a more reliable diagnostic method.

A cross-sectional study was conducted to obtain up-to-date information on the prevalence of echinococcosis in dogs. By using a simple random sampling technique, the samples were collected from six districts of the Kashmir Valley *viz.* Anantnag (33.73°N 75.15°E, altitude 1601masl, population 10.8 lakh), Pulwama (33.87°N 74.89°E, altitude 1630 masl, population 7.77 lakh), Srinagar (34.08°N 74.79°E, altitude 1585 masl, population 11.8 lakh), Kupwara (34.53°N 74.25°E, altitude 1615 masl, population 70 thousand), Bandipora (34.50°N 74.69°E altitude 1581-1578 masl, population 3.92 lakh) and Budgam (33.93°N 74.64°E, altitude 1610 masl, population 7.54 lakh) (Fig. 1). Agriculture is the most common occupation in all six districts, with an aggregate literacy rate of 60 per cent.

The study was conducted from February, 2018 to December, 2019 at the Department of Zoology, Kashmir University for detecting coproantigens of *Echinococcus granulosus*. A total of 476 faecal samples were collected and examined as part of this study. All faecal samples were collected from stray dogs of different districts of the Kashmir valley; both fresh, as well as dried faecal samples, were collected. After collection of the faecal samples, they were stored for at least 14 days at -20°C before being further processed. Immunodiagnostic test ELISA was used for the detection of specific coproantigens of *Echinococcus* spp. from the samples of dog faeces. Commercially available kit (Qayee-Bio Canine *Echinococcus* kit) was used for the detection of *Echinococcus granulosus* species according to the instructions of the manufacturer. The test was performed by using dog faecal material diluted in the kit's sample dilution buffer as per the instructions. After centrifugation of the sample suspension for 20 minutes at room temperature, the supernatant obtained were used for the ELISA test. Coproantigen levels were estimated and interpretation of the results was made following the attached protocol.

Statistical analysis was done using Statistical Package R version 3.5.3. Descriptive statistics was used to get the prevalence of Echinococcosis infection in stray dogs in different districts of Kashmir valley. The Chi-square test was employed to test the association

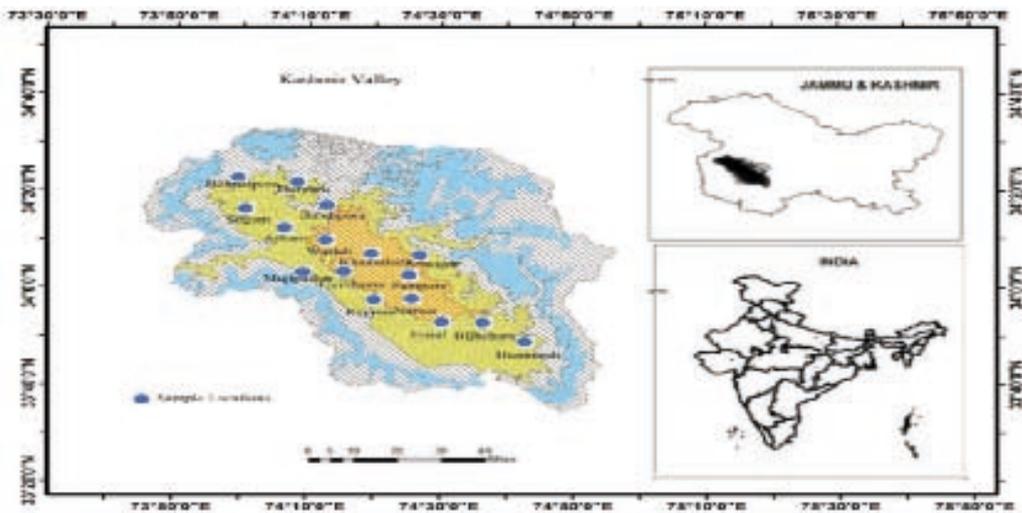


Fig. 1 Map of Kashmir showing sites of sample collection

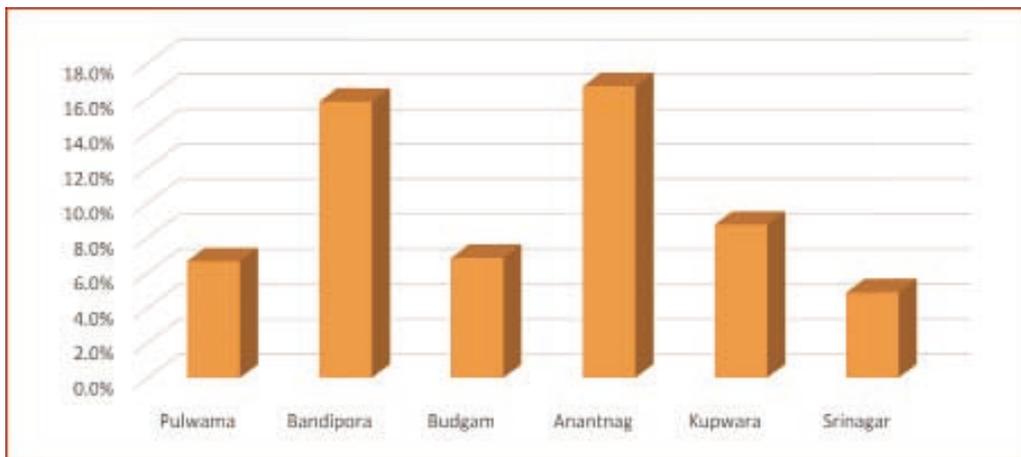


Fig. 2. Prevalence of Echinococcus infection in stray dogs of different districts of Kashmir valley.

Table 1. Prevalence of echinococcus infection in stray dogs of different districts of the Kashmir valley

S. No.	District	Total	Positive	Negative	Per cent
1	Pulwama	75	5	70	6.7
2	Bandipora	76	12	64	15.8
3	Budgam	73	5	68	6.8
4	Anantnag	90	15	75	16.7
5	Kupwara	80	7	73	8.8
6	Srinagar	82	4	78	4.9
7	Total	476	48	428	10.1

Chi-Sq = 11.446, DF = 5, P-Value = 0.043

of Echinococcus infection in stray dogs of different districts in the Kashmir valley. The results were considered statistically significant when the p-value was <0.05.

Of the 476 dog faecal samples collected from different areas, 48 faecal samples were coproantigen positive for *Echinococcus* spp. representing overall coproantigen prevalence

for *Echinococcus* spp. in Kashmir valley as 10.1 per cent. Faecal samples were collected from different areas like streets, roadsides, orchards, parks, playgrounds and open fields of Kashmir valley. Out of 48 positive faecal samples, the highest prevalence rate of infection (15/90, 16.7%) was reported from Anantnag district followed by Bandipora (12/76, 15.8%), Kupwara (7/80 8.8%), Budgam (5/73, 6.8%), and Pulwama (5/75, 6.7%) districts. The lowest rate of infection was reported from Srinagar district (4/82, 4.9%). The overall infection rate among dogs of the Kashmir valley was estimated as 10.1 per cent (Table 1 and Fig. 2). Chi-Square value calculated was 11.446 and p-value was 0.043.

The prevalence of *E. granulosus* in dogs and its metacestode in herbivores varies considerably throughout the world (Matossian *et al.*, 1977). This zoonotic parasite maintains itself primarily in a life cycle between domestic dogs (definitive host) and domestic ungulates (intermediate host). Echinococcosis or hydatidosis is of significant importance causing economic losses globally. It has been included in the list of neglected tropical diseases and is considered to be one of the six priority neglected zoonotic diseases (WHO, 2014). Most of the regions in the Kashmir valley are covered by rural areas and agricultural lands. Sheep and cattle are important sources of income for people living in the majority of these rural areas. Moreover, a huge population of stray dogs is found in these areas. While WHO-sponsored national multi-centric survey has reported the average human-dog ratio in the country as 1:36 (Sudarshan *et al.*, 2006), this ratio for the Kashmir Valley is 1:12. The high population of stray dogs near butcher shops in agricultural lands and those wandering on main roads may be a source of dissemination of the echinococcosis infection. Livestock slaughter without proper veterinary control and the common practice of feeding dogs with the viscera of home butchered ungulates slaughtered on homes especially on the occasion of Eid-Ul-Adha has become a widespread rural practice in the Kashmir valley. All these factors are highly favourable for the transmission of echinococcosis.

## Summary

The results of the present study conducted in six districts of the Kashmir valley indicated that the overall prevalence of echinococcosis infection in dogs by sandwich ELISA was 10.1 per cent which agrees with other studies that were conducted in different parts of the world. In the Czech Republic, Svobodova and Lenska (2002) used coproantigen ELISA test in dogs to determine the prevalence of echinococcosis and their results revealed the prevalence of about 8.1 per cent in the definitive host. In Argentina, Cavagion *et al.* (2005) found a 7.3 per cent prevalence of echinococcosis in dogs by sandwich ELISA test. However, in other studies on dogs, higher prevalence rates of echinococcosis infection have been recorded, such as Craig *et al.* (1995) who reported a 22.7 per cent incidence of echinococcosis in Uruguay using a sandwich ELISA test. With the use of sandwich ELISA tests, Moro *et al.* (1999) and Lopera *et al.* (2003) revealed 46 per cent and 82 per cent prevalence of echinococcosis, respectively.

However, in different districts of the Kashmir valley, the prevalence of echinococcosis in dogs was nearly similar. The sole exception to this was seen in Srinagar district where a frequency of only 4.9 per cent was observed.

The high prevalence of echinococcosis infection in dogs in the valley of Kashmir shows the poor concern of authorities as well as the general population towards control measures. In view of the increased prevalence rate and high intensity of infection among dogs in this study, further studies are suggested to explore the reinfection rate in dogs. Moreover, it is possible that the associated risk factors of the infection to humans is also very likely. This information is however very important for understanding the transmission dynamics of *Echinococcus granulosus* in the Kashmir valley, which, in turn, will assist in the fruitful development of an effective control program for this important zoonosis in this area.

## Acknowledgment

The authors are highly thankful to

the Head, Department of Zoology, University of Kashmir, Srinagar for providing technical support.

### Conflict of Interest

The authors declare that they have no conflict of interest.

### References

- Babos, S. and Nemeth, I. 1962. Az echinococcosis szerodiagnosztikijinak kerdesehez. *Magy. Allatorvosok Lapja*. **17**: 58-60.
- Battelli, G. 2009. Echinococcosis: costs, losses and social consequences of a neglected zoonosis. *Vet. Res. Commun.* **33**: 47-52.
- Budke, C.M., Deplazes, P. and Torgerson, P.R. 2006. Global socioeconomic impact of cystic echinococcosis. *Emerg. Infect. Dis.* **12**: 296.
- Cavagión, L., Perez, A., Santillan, G., Zanini, F., Jensen, O., Saldía, L., Díaz, M., Cantoni, G., Herrero, E., Costa, M.T. and Volpe, M. 2005. Diagnosis of cystic echinococcosis on sheep farms in the south of Argentina: areas with a control program. *Vet. Parasitol.* **128**: 73-81.
- Chisti, M.Z., Tak, H., Ahanger, A.G. 2000. Epidemiology of hydatidosis in human population of Kashmir Valley. *Oriental Sci.* ISSN 0971 -703 X
- Craig, P.S., Gasser, R.B., Parada, L., Cabrera, P., Parietti, S., Borgues, C., Acuttis, A., Agulla, J., Snowden, K. and Paolillo, E. 1995. Diagnosis of canine echinococcosis: comparison of coproantigen and serum antibody tests with arecoline purgation in Uruguay. *Vet. Parasitol.* **56**: 293-301.
- Deplazes, P., Dinkel, A. and Mathis, A. 2003. Molecular tools for studies on the transmission biology of *Echinococcus multilocularis*. *Parasitology*. **127**: S53-S61.
- Dinkel, A., von Nickisch-Roseneck, M., Bilger, B., Merli, M., Lucius, R. and Romig, T. 1998. Detection of *Echinococcus multilocularis* in the definitive host: coprodiagnosis by PCR as an alternative to necropsy. *J. Clin. Microbiol.* **36**: 1871-1876.
- Fomda, B.A., Khan, A., Thokar, M.A., Malik, A.A., Fazili, A., Dar, R.A., Sharma, M. and Malla, N. 2015. Sero-Epidemiological survey of human cystic echinococcosis in Kashmir, North India. *PLoS One*. **10**(4), e0124813. doi: 10.1371/journal.pone.0124813. PMID: 25915867; PMCID: PMC4411056.
- Fomda, B., Sofi, B.A., Thoker, M.A. and Kakru, D.K. 2002. Human hydatidosis in Kashmir North India: A hospital based study. *J Parasit. Dis.* **26**: 34-37.
- Jenkins, D.J., Fraser, A., Bradshaw, H. and Craig, P.S. 2000. Detection of *Echinococcus granulosus* coproantigens in Australian canids with natural or experimental infection. *J. Parasitol.* **86**: 140-145.
- Lopera, L., Moro, P.L., Chavez, A., Montes, G., Gonzales, A. and Gilman, R.H. 2003. Field evaluation of a coproantigen enzyme-linked immunosorbent assay for diagnosis of canine echinococcosis in a rural Andean village in Peru. *Vet. Parasitol.* **117**: 37-42.
- Matossian, R.M., Rickard, M.D. and Smyth, J.D. 1977. Hydatidosis: a global problem of increasing importance. *Bulletin of the world health organization*. **55**: p.499.
- Moro, P.L., Bonifacio, N., Gilman, R.H., Lopera, L., Silva, B., Takumoto, R., Verastegui, M. and Cabrera, L. 1999. Field diagnosis of *Echinococcus granulosus* infection among intermediate and definitive hosts in an endemic focus of human cystic echinococcosis. *Trans. R. Soc. Trop. Med. Hyg.* **93**: 611-615.
- Nepalia, S., Joshi, A., Shende, A. and Sharma, S.S. 2006. Management of echinococcosis. *J Assoc Physicians India*. **54**: 458-462.

- Sakai, H. 1996. Studies on coproantigen detection for diagnosis of *Echinococcus* infection in definitive hosts. *Jpn. J. Vet. Res.* **44**: 125-127.
- Sudarshan, M.K., Mahendra, B.J., Madhusudana, S.N., Narayana, D.A., Rahman, A., Rao, N.S.N., X-Meslin, F., Lobo, D. and Ravikumar, K. 2006. An epidemiological study of animal bites in India: results of a WHO sponsored national multi-centric rabies survey. *J Commun. Dis.* **38**: p.32.
- Svobodova, V. and Lenska, B. 2002. Echinococcosis in dogs in the Czech Republic. *Acta Vet. Brno.* **71**: 347-350.
- Unruh, D.H.A., King, J.E., Allen, J.R. and Eaton, R.D.P. 1973. Parasites of dogs from Indian settlements in northwestern Canada: a survey with public health implications. *Can. J. Comp. Med.* **37**: 25.
- World Health Organization. 1993. *WHO Working Group Meeting on Clinical Medicine and Chemotherapy of Alveolar and Cystic Echinococcosis, Besançon, France, 10 October 1992: report* (No. WHO/CDS/VPH/93.118. Unpublished). World Health Organization.
- World Health Organization. Report of the WHO Informal Working Group on Echinococcosis November 2013. Geneva, Switzerland: World Health Organization. 2014. ■