

## ORIGINAL PAPER

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**Echinococcus granulosus infection of farm dogs of Iran**

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**Abstract** The prevalence and distribution of *Echinococcus granulosus* in sheepdogs was studied in 13 provinces of Iran, where 90% of the Iranian sheep and goat populations and, thus, sheepdogs are found. Worms were found in 27.17% of 390 dogs successfully purged with 4 mg/kg arecoline hydrobromide. The highest prevalence was detected in dogs from the rural areas of Isfahan (central part of Iran) and the lowest, in dogs from those of Sistan (Southeast Iran). The frequency distribution of *E. granulosus* was overdispersed, with only a few animals harboring heavy infections.

**Introduction**

Half of the 60 million inhabitants of Iran are villagers who rely on 70 million sheep and goats distributed in about 50,000 villages as an important source of income. The number of sheep per flock is not high (about 100) and 1 sheepdog belongs with each flock. Thus, the number of sheepdogs can be roughly estimated at 700,000. As a rule, sheep (*Ovis aries*) and dog (*Canis familiaris*) are the main hosts of *Echinococcus granulosus* in many parts of the world, including Iran. Among other types of dogs, farm dogs are in close contact with the farmer, his family, and his residential area as well as with nomads and their black tents. Thus, parasitic infections, especially *E. granulosus* infection, pose a human health hazard and cause economic losses in terms of animal products. Data essential for the establishment and monitoring of a control program for *E. granulosus* are very scarce in Iran. Only one report has been published

on helminth infections in sheepdogs around Tehran (Eslami and Mohebali 1988), although several such reports exist on those in stray dogs (Hoghoughi and Jalayer 1967; Moatakef et al. 1976). The present study was carried out to demonstrate the prevalence of *E. granulosus* in farm dogs of Iran.

**Materials and methods**

This survey was carried out in 13 provinces of Iran (Fig. 1) in which 90% of the Iranian sheep and goat populations and, thus, sheepdogs are found. A total of 30 dogs selected from 30 farms of each province were fitted with a numbered collar for identification. Records were kept of their age, sex, and breed, although as a rule the latter was mixed local breed. They were orally dosed with 4 mg/kg arecoline hydrobromide. Feces and samples of the intestinal mucosa of the successfully purged dogs were collected and kept in 30% formalin; 1 month later the feces were washed through a 100-mesh sieve. The residue was examined under a bright light on a black background and the numbers of *Echinococcus granulosus* were determined and recorded separately for each dog and each province.

**Results**

Of the dogs that were successfully purged, 27.17% were found to be infected with *Echinococcus granulosus*. A significant difference in the prevalence of *E. granulosus* was found between the 13 provinces (Table 1), with the percentage of infection varying between 3.3% in Sistan (Southeast Iran) and 63.3% in Isfahan (central Iran).

The number of *E. granulosus* detected in each sample varied widely from a single worm to about 2,000 parasites. Most dogs (57) harbored fewer than 50 worms. The overall mean worm burden (96.69) is distorted by two infections, one in a puppy bearing 2,000 worms and the other in an adult dog harboring 1,750 worms. There was no significant difference in the prevalence or frequency distribution with regard to canine age, sex, or breed.

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**Fig. 1** Frequency distribution of *Echinococcus granulosus* in 13 provinces of Iran

**Table 1** Frequency distribution of *Echinococcus granulosus* in 390 farm dogs in Iran

Different provinces	Number of dogs	% Infection	Average number of worms
Tehran & central	30	23.3	181
West Azerbayedjan	30	50	12
East Azerbayedjan	30	33.3	29
Mazandaran	30	43.3	30
Kordestan	30	10	9
Lorestan	30	20	104
Ilam	30	46.6	53
Khuzestan	30	20	9
Isfahan	30	63.3	697
Fars	30	23.3	6
Kerman	30	6.6	8
Sistan & Baluchestan	30	3.3	14
Khoraasan	30	10	104

**Discussion**

The prevalence observed in this study is comparable with the high prevalence reported in dogs from many other countries in which hydatid disease is endemic in people. Moreover, this prevalence rate (27.17%) is in line with the 29% finding reported by Eslami and Mohebali (1988) in farm dogs around Tehran. Differences in the exposure to hydatid cysts may affect the prevalence rates. It is probable that sheepdogs of Sistan and Isfahan, which showed the lowest and highest rates of infection (3.3% and 63.3%, respectively), have less and greater access, respectively, to infected offal due to the lower and higher numbers of sheep (800,000 and 2.5 million, respectively) scattered over a larger and smaller land area (181,000 and 104,000 km<sup>2</sup>, respectively). On the other hand, the dryer climate of Sistan as compared with Isfahan and the lower per capita income in the former may reduce the longevity of hydatid cysts in the environment and, hence, the number of sheep being slaughtered for human consumption under nonhygienic conditions. These factors may also be responsible in part for the differences observed in the prevalence of *Echi-*

*nococcus granulosis* in other regions of Iran. It is noteworthy that the highest rate of infection with *E. granulosis* in stray dogs was also reported from Isfahan in the central part of Iran (Hoghoughi 1971).

In Iran, sheepdogs gain access to infected materials in a number of ways. Deliberate feeding of infected viscera to dogs and/or scavenging of sheep and goat carcasses continues to be the major source of infection. In rural areas, sheep are regularly slaughtered on farms and the offal is available to scavenging dogs. Dogs may become infected by scavenging of dead animals in nearby fields or via local butchers and abattoirs or from houses in which sheep have been killed for household consumption.

No correlation can be shown between the prevalence of hydatid disease in humans and that of *E. granulosis* in dogs in Iran. As based on a study on hospital-diagnosed human disease during 1983–1987, the prevalence of hydatid disease in humans in Sistan (Southeast Iran) and Isfahan (central Iran), where the lowest and the highest rates of infection with *E. granulosis* were reported (3.3% and 63.3%, respectively), was similar and was determined to be 0.86 and 0.33 cases/100,000 inhabitants, respectively. In contrast, in Khorassan (Northeast Iran), where the highest incidence of hydatid

disease in humans (4.4 cases/100,000 inhabitants) was reported, only 10% of sheepdogs harbored *E. granulosis*.

To complete the epidemiological picture of hydatidosis, further study is needed to determine the reinfection rate in dogs and the age-intensity and age-prevalence patterns in sheep. This information is essential for an understanding of the transmission dynamics of *E. granulosis* in Iran, which, in turn, will assist in the development of an effective control program for this important zoonosis.

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