

Study of Echinococcus Granulosus and Echinococcus Multilocularis Infections in Canidae in Ardabile Province of Iran

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Summary

In a cross-sectional study (1992-1994) on wild and domestic carnivores infected with *E. granulosus* and *E. multilocularis* in plain and mountaineous areas of Ardabile province, 130 intestinal specimens of dogs, red fox (*Vulpes vulpes*), wolves (*Canis lupus*), jackals (*Canis aureus*), wild and domestic cats (*Felis chaus*) were collected and examined for *Echinococcus* species. The percentage of *E. granulosus* infection was 29.6%, in dogs and 25% in wolves. While in case of *E. multilocularis* the percentage was 22.9% and 16% in red fox and jackals, respectively. The prevalence of *E. granulosus* in plain and mountainous areas were 23% and 33.3% while that of *E. multilocularis* were 23.7% and 10.5%, while the prevalence of *E. granulosus* these in male and female animals were 38.8% and 15.3% and that of *E. multilocularis* were 19.2% and 23.4% respectively. Seasonal changes in prevalence of *E. granulosus* were 50%, 29.2%, and 2.5% in spring, autumn and winter respectively, while that of *E. multilocularis* were 11.8% in spring, 21.4% in autumn and winter. The density of the infection with *E. granulosus* in 22.2% of wolves were low while 25% were mild. In dogs the density of the said specie was mild in 7.6% . *E. multilocularis* among 15.8% red fox and jackals were found low, 2.8% mild and 4.3% heavy, respectively. None of 2505 collected rodents were infected, but during this study three human cases were found infected with alveolar hydatid cyst from the same areas.

Key words: *E. granulosus*, *E. multilocularis*, Canidae, Cestoda

Introduction

Hydatid cyst disease in humans is caused by a larval stage (metacestode) of *Echinococcus spp.* which exhibits a significant health hazard in various climatic areas. In Iran the tribal life depends on sheep and dogs which are important hosts of Echinococcosis. This disease causes significant economic loss in sheep husbandary in the world especially in Mediteranian and the Middle East countries. Sadighian (1969) showed 6.8% of stray dogs infected with *E. granulosus*. North western part of Iran is an important sheep husbandary area. Tribes migrate from summer to winter quarters in order to feed their ruminant and they have to keep there sheeps and dogs close together. The latter is an important source of Echinococcosis as well as visceral Leishmaniasis (Sato 1993). In a study carried out on the *E. granulosus*, Mobedi (1973) found 5.71% infection among dogs, whereas this figure was 21.7% in previous studies (Sadighian *et al.* 1969). In a similar study, Sharifi and Zia (1996) showed that 7.4% of dogs were infected with *E. granulosus*. While previously he reported 6.8% of dogs infected with the said specie. (Sharifi and Hadizadeh 1994). The area neighbouring to Azerbaijan and Turkey are the areas from where the zoonotic disease like *Echinococcosis* and *Leishmaniais* extend to Europe and Russia. These areas constitute geographically extensive endemic nidus for human being. The study of reserviors, source of infection, and definitive and intermediate hosts needs vast research works .

Materials & Methods

The method introduced by Thompson and Eckert (1983) was used with slight modification.

- a : Personal equipments
- b : Hunting gun, autopsy devices
- c : Various lab plastic and glasswares
- d : Preservative and staining materials

The descriptive and analytical study was carried out during three years. Most of the animals were shot by gun based on the lisencc obtained from the Department of Protection Environment. The carcases of animals were transfered to laboratory where the intestines were cut into 3 parts. The internal side of each part was scratched with a sharp blade to remove attached worms. The collected slury was added to the contents of the intestines, then subjected to several washing with normal saline. The last precipitate was kept in 10% formaldehyde solution for further analyses. Each sample was examined qualitatively and quantitatively for the presene of various species of *Echinococcus* using either a disecting microscope or stero microscope.

Results

From March 1992 to December 1994, 130 canidae animals including 70 red fox, 27 dogs, 25 jackals, 4 wolves, 2 wild cat, 1 domestic cat and 1 meles were collected for this study, and the following results were observed.

Prevalence of *E. granulosus* in dogs was 24.6%, and 25% in wolves. While *E. multilocularis* was found in 22.9% of red fox and 16% jackals. Maximum infection density with *E. multilocularis* tapeworm in one red fox was 7863. Infection with *E. granulosus* in animals of plain area were significantly higher than those from mountain ($P < 0.005$) and was 23% and 33.3% respectively. While *E. multilocularis* infection was 24.4% and 10.55% in animals of plain and mountaineous area, that is significantly high in plain areas ($P < 0.005$). Seasonal prevalence for *E. granulosus* was 60%, 29.2% and 2.55% in spring, autumn and winter, respectively, while for *E. multilocularis* was 11.8% in spring and 21.4% in autumn and winter.

Sexual prevalence with *E. granulosus* was 38.8% and 15.3% among male and female dogs, while infection with *E. multilocularis* was 19.2% and 23.4% respectively. Regarding hosts, it must be noted that *E. granulosus* was isolated from dogs and wolves. The former is the reservoir for domestic cycle and the latter encounters sylvatic cycle. Both are definitive hosts. *E. multilocularis* was isolated from red foxes and jackals.

Foxes are included in sylvatic cycle in tundra areas of Europe and Moghan plain area where jackals are also considered as another important hosts for *Echinococcus*. Deciduous jungle scavengers in tundra edges are most important sources of infection to rural people.

Discussion

In this study the infection rate of *E. granulosus* in dogs and wolves was 29.6% & 25% respectively. Infection rate was very high especially among dogs, which serve as important reservoir sources for animal and human infection. Foxes with 29.9% infection of *E. multilocularis* are important sources of alveolar hydatid cyst among the people in this area (Mobedi 1973).

It is noteworthy that jackal infection was first reported in Iran. In the case of *E. multilocularis* jackals would be even more important than foxes in serving as potential sources for human infection because jackals inhabit closer to human than foxes and feed on wild rodent (Mobedi 1994, Comand 1973). The latter reason may presumably explain why jackals were predominantly infected with *E. multilocularis*.

Alveolar infection extended from Azerbaijan Republic through Ardabile province of Iran where infection rate was 35.45% among red foxes. (Mobedali 1996 , Eckert and Delpaze 1999).

It seems that microtin rodents of Moghan plain area are important definitive hosts for keeping the life cycle of parasite in Ardabile area (Thompson and Eckert 1983). However, we believe that predator prey relation in tundra area more probably facilitates *E. multilocularis* infection cycle. As the number of prey (microtin rodent) increases, predator depending on them (red foxes) surfing around become greater in number. After hunting slower moving (infected) rodents, they become more heavily infested. Collectively, it seems that plain areas are more suitable nidus for *E. multilocularis* as compared to mountaineous areas. The latter is suitable nidus for keeping domestic cycle of *E. multilocularis* (Abuladze 1964 ; WHO 1976). These areas are important places for grazing of sheep. Most of the grasslands in western Iran are situated on slope of mountains and serve as significant areas for tribal residence. Tribal life depends on its livestock, sheep and dogs.

Also infection with *E. multilocularis* showed high prevalence among red foxes in fall, and winter. In fall and winter, red foxes possibly lose most of the other food sources and live only on rodent, they simply reach them in cultivated areas where ploughing expose rodent colonies to foxes.

Prevalence of infection shows significant differences in below and above the age of 5 year. The prevalence for dogs of >5 years of age was 33.3% whereas it was 26.3% for <5. year dogs. This difference may partly be due to fact that only old dogs were permitted to be autopsied. The prevalence of *E. multilocularis* was 23% below 5 years old foxes. No infection was observed among older than 5 year foxes. Normally younger animal are exposed to infection because they are more active predators (Beard 1973). In addition, immunity against both *Echinococcus* species is increased by the frequency of infection as well as by the age, which may be a significant reason why incidence of infection in older animals was found zero or low (Mobedi 1971). Also, most of the investigators including those from Alaska and Japan agree that in animals with an increase in age the rate of *E. multilocularis* infection decreases. The definitive host of *E. multilocularis* (red fox), found with prevalence of 15.87%, the major definitive host of *E. multilocularis* red foxes with infection, 4.2% mild infection and, 2.8% with high infection rates. This observation opines that red fox has a key role in keeping the life cycle in enzootic areas. 12% of jackals, were found with low infection, and 4% with mild infection. Thus, jackals could serve as sources of infection in the edges of endemic areas posing more danger on men since they live closer to them.

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