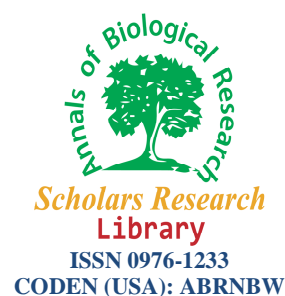




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### Epidemiological studies on fauna and prevalence of parasite helminthes on Red Fox (*Vulpes vulpes*) in Sarab district, East Azerbaijan Province, Iran

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#### ABSTRACT

An epidemiological study of intestinal helminths on 52 red foxes (*Vulpes vulpes*) from 30 out of 162 villages around of Sarab region (East Azerbaijan Province), the prevalence of any intestinal parasitic infection was (78.9%). Study results and helminth counts were compared Using necropsy results as a reference. The most common nematodes were helminths: *Mesocostoides lineatus*, *Uncinaria stenocephala*, *Toxocara canis*, *Toxascaris sp* and *Rictolaria sp*. The most common Cestodes were *Taenia spp.* and *D. caninum* and the most acanthocephalan was *M. hirudinaceus*. Based on the necropsy methods, 96.5% foxes harbored the adult worms of at least one parasitic helminth species. 2 foxes (3.8%) were positive for filarial parasites but adult *Dirofilaria immitis* was not found in the heart of animals. All filarial species and all stages were found only in foxes killed at an around Ardaha village. Fecal examinations on 52 foxes identified eggs of *U. stenocephala* (22.4%) and *Toxocara canis* (44.5%), *Ancylostoma caninum* (14.5%), *Toxascaris sp* (2.7%), *Trichuris vulpis* (2.7%), larvae of *Strongyloides spp.* (1.7%) and oocysts of *Eimeria spp* (5.8%). Significant difference in prevalence was found for *T. canis* and *Uncinaria stenocephala* according to host sex. Intestinal scrapings for these samples by microscopic examination, *Echinococcus* were not seen. The infection rates were significantly different in the eight areas being higher in the area of Ardaha.

**Key words:** Red Fox (*Vulpes vulpes*), helminths, Epidemiology, Iran, Sarab.

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#### INTRODUCTION

Populations of red foxes are increasing throughout Asia and have recently colonized cities on the continent. The red fox is a very adaptable, swift, and unobtrusive canid. Usually described as solitary and territorial, preying on voles in meadows, the red fox living in cities, or urban, lives

in small groups and relies essentially on anthropogenic food resources. The red fox seems to offer a taste of nature to city dwellers; it also brings along its parasites. The red fox is an important reservoir host of parasites, which can be spread to another animals and humans [21]. The red fox is the definitive host of the cestode *Echinococcus multilocularis* [25]. This helminth is mainly bond to the red fox wild rodent predator-prey system in West Asia, and responsible for highly pathogenic alveolar echinococcosis in humans [4, 15, 23, 25]. The nematode *Toxocara canis* is another zoonotic helminth of public health concern occurring in the red fox. It is responsible for larva migrans syndromes in humans, particularly severe in children. The red fox is the most widespread wild carnivore in Iran and represents a possible reservoir for domestic animal and zoonotic parasites. Wild and domestic animals are considered as main sources of emerging human and domestic livestock pathogens and zoonoses of public health significance [21]. In Iran, four categories of canids, namely feral or stray dogs, working sheepdogs, pet dogs and wild canids [especially red foxes and jackals] are known as reservoirs of numerous zoonotic diseases [12,15,23]. There are some reports on prevalence of intestinal helminths among canids from different parts of Iran [4, 8, 12, 13, 15, 23, and 24]. Due to relatively high annual precipitation and Most of the inhabitants of Sarab district are involved in agriculture and animal husbandry And Sarab plain has become one of the most important areas for farming, where nomadic, rural, and urban inhabitants come into close contacts with domestic and wild canids. There was no report on the prevalence of helminthic infections in the carnivores of this area. Since then, intensive economic and social alterations including rapid population growth and development of villages and cities have resulted to major ecological changes in Moghan Plain, Iran [23]. The purpose of this study was to establish the prevalence endoparasites of the fox population of this region and to extend the analysis to several tissue parasites, particularly zoonotic parasites.



Fig 1. Geographical map of Sarab district in East Azerbaijan province, North West of Iran. The study area is shown by its zooming.

## MATERIALS AND METHODS

Sarab district is located in East Azerbaijan Province in Northwestern Iran with moderate mountainous climate. It covers an area of approximately 18/3452 km<sup>2</sup>, including 168 villages, and its population is estimated to be 148,831 of which 43% is settled in urban areas and 57% is settled in rural areas. Most of the inhabitants of Sarab district are involved in agriculture and domestic animals husbandry, such as sheep, goats, chickens, and dogs. The city of Sarab is situated at an altitude of 1650 m above the sea level (Figure1).

### Samples

Having got permission from the Health deputy, Veterinary Organization and Environment Agency Organization of East Azerbaijan province, 52 foxes were hunted by the environmental peacekeepers of Sarab. The foxes were mainly hunted around Sarab and a nearby village. Immediately after the hunt, foxes underwent necropsy. Examination of different organs including alimentary canal, abdominal cavity, liver, Kidneys, Heart and lungs for parasite infections were done. Foxes were necropsy and Carcasses were stored in sealed plastic bags and All Samples were frozen at -80°C for at least 5 days for safety reasons and then kept at -20 °C until used. Before necropsy to inactivate infective material, The animals were individually labeled and date, weight, location, presence or absence of parasitic disease symptoms [skin abnormalities, dry exfoliative dermatitis, periorbital alopecia, hair loss, cachexia, lethargy and, local or general lymphadenomegaly, keratoconjunctivitis, big belly, diarrhea and splenomegaly] and Environmental data with local information as well as other distinctive characteristics of each animal were collected. Each fox was assigned a number for identification purposes. Fecal samples were divided in three aliquots that were analyzed by concentration Formol-ether technique and sucrose floatation method were performed according to Muller 2002[14] and Zajac and Gary 2006[22] respectively. The worms found in the washed contents of alimentary canal and sliced organs were collected, counted and indentified under the stereomicroscope after being cleared in lactophenol. The entire contents of the intestinal lumen and the scraping of the internal intestinal wall were treated using the sediment and counting technique according to [5], to detect eggs, cysts, and smaller parasites from concentrated material. The sediment was partly examined by microscopy, and partly stored in 70% ethanol for molecular analyses. Lungs, heart, and main vessels were dissected and adult parasites, larvae, eggs, or a combination were directly collected or detected in lung washes or pulmonary section smears. Nematodes were clarified in lactophenol, identified in accordance with Anderson 1992[1]. Cestodes were identified in accordance with Schmidt 1986 [19], and were stored in 70% ethanol for molecular analyses. Microfilariae species identification was based on morphology, morphometry, and staining technique as described previously [11].

### Statistical analyses

Chi-squared [ $\chi^2$ ] test and Fisher's exact test was used to compare percentages. The differences were considered statistically significant when probability [P] value  $\leq 0.05$ . The 95% confidence intervals (95%CI) of prevalence rates were calculated. Statistical analysis was performed using Epi Info software, version 6.

## RESULTS

An epidemiological study of intestinal helminths in 52 red foxes from 30 villages around of Sarab region (East Azerbaijan Province) was collected. The prevalence of any intestinal parasitic infection was 41/52(78.9%). Test results and helminth counts were compared. Using necropsy results as a reference. The prevalence of identified worms were *Mesocostoides* sp. (71.9%), *Rictolaria* sp. (47%), *T. canis* (35.6%), *Toxascaris* spp. (30.1%), *Oxynema crassispiculum* (23.2%), *Spirocerca lupi* (17.9%), *Physaloptera praeputialis* (3.8%), *Spirura Jytipleurites* (11.5%), *Onicola canis* (15.8%), *M. hirudinaceus* (38.2%), *Trichuris vulpis* (3.8%); hookworms *Ancylostoma caninum* (9.1%) and *Uncinaria stenocephala* (16.3%), *Taenia* spp. (38.4%) (Including 1 cases of *Taenia polyacantha*, 3 *Taenia endothoracica* and 7 *Taenia hydatigena*), *Alaria* spp. (1%) and *D. caninum* (3.8%). Based on the necropsy methods (96.5%) foxes harbored the adult worms of at least one parasitic helminth species. 2 foxes (3.8%) were positive for filarial parasites but adult *Dirofilaria immitis* was not found in the heart of animals. All filarial species and all stages were found only in foxes killed at an around Ardaha village. Fecal examinations on 52 foxes identified eggs of *U. stenocephala* (22.4%) and *Toxocara canis* (44.5%), *Ancylostoma caninum* (14.5%), *Toxascaris* sp (2.7%), *Trichuris vulpis* (2.7%), larvae of *Strongyloides* spp. (1.7%) and oocysts of *Eimeria* spp (5.8%). A relatively number of foxes were infected by *Toxocara canis* (35.6%) and *Toxascaris* spp. (30.1%), No helminths were found in 11 foxes (21.1%); 17 specimens (32.7%) had one helminth species; 13 foxes (25%) had two species, 9 animals (17.3%) had three species, and tow (3.8%) had four species. Finally, in present study *Toxocara canis* infection was greater frequent (35.6%) than *Ancylostoma caninum* (9.1%) and *Uncinaria stenocephala* (16.3%). Significant difference in prevalence was found for *T. canis* and *Uncinaria stenocephala* according to host sex. Intestinal scrapings for these samples for *Echinococcus* by microscopic examination were not seen. The infection rates were significantly different in the eight areas being higher in the area of Ardaha.

## DISCUSSION

The result of this survey was most prevalent with a high mean intensity belonged to *Mesocostoides* sp, *Toxocara canis* and *Uncinaria stenocephala*. This helminthes has already been reported in jackals, red foxes, wolves, stray, and sheep dogs from different parts of Iran [3, 4, 8, 12, 13, 15 and 24]. The presence of this helminthes has also been documented in other countries including Kyrgyzstan, Belarus, Spain, Portugal, Great Britain, Denmark, Jordan and Italy [2,6,7,10,16,17,18,20,25]. El- Shehabi et al in Jordan reported all foxes were infected with at least one intestinal helminth species. Intestinal helminths found in foxes included cestodes (*D. caninum*, *Joyeuxiella*, *Uncinaria stenocephala*, *Diplopylidium*, *Mesocostoides*), nematodes (*Protospirura*, and *Oxynema*) and an acanthocephalan (*Macracanthorhynchus*)[6]. Smith et al in a study on 588 red foxes in Great Britain; no animal was shown to harbor this parasite[20]. Richardsa et al However in a study on 843 foxes from southern England revealed the presence of 13 parasite species: five nematodes, four cestodes, two trematodes and two acanthocephalans were found. The most prevalent parasite in this study was *Uncinaria stenocephala* [16]. In Spain Criado-Fornelio et al., 2004; demonstrated the presence of nine species, including six nematodes, two cestodes and one trematode. Nematodes were the most common parasites of foxes, followed by cestodes and trematodes. Greater levels of cestodes *Uncinaria stenocephala* were found in foxes in areas [2]. Ziadinova et al in Kyrgyzstan showed that red foxes are a major definitive

host of *E. multilocularis* in this country. This also demonstrates that the abundance and prevalence of *E. multilocularis* in the natural definitive host are likely to be high in geographical regions where there is a concomitant high prevalence in alternative definitive hosts such as dogs. In addition *Mesocestoides* spp., *Dipylidium caninum*, *Taenia* spp., *Toxocara canis*, *Toxascaris leonina*, *Capillaria* and *Acanthocephala* spp. were found in foxes [25]. The prevalence of *Mesocestoides lineatus* in our study was 71.9%, which was higher than all previous reports except one from western part of Iran [3,8,12,13,15,24]. but was similar to result of 4; Zare-Bidaki et al., 2010 and result of other country [2,10,17,25]. *Rictolaria* spp. was the second most prevalent parasite (47%) in our study, which was similar to all previous reports from western part of Iran [3,8,12,13,15,17,23,24]. in other study collected 1040 red foxes from various localities in Denmark during 1997-2002, revealed 21 helminth species at autopsy, including nine nematode species; seven cestodes; four trematodes: one acanthocephalan; the higher prevalence belong to *Toxocara canis* (59.4%), *Uncinaria stenocephala* (68.6%), *Mesocestoides* sp. (35.6%) [17]. Intestinal scrapings for these samples were negative for *Echinococcus* by microscopic examination. The infection rates were significantly different in the area of Ardaha. The present study confirms that red foxes in Sarab host many parasite species reported previously in foxes in Iran. A comparison of our results with those reported in other surveys is difficult, because most of the previous published studies report on parasite prevalence; the different techniques applied to recover the parasites may have some influence on prevalence estimates. However, several observations can be made from our data. Numerous parasites found in this study suggest that foxes could be a potential source of infestation to domestic pets and occasionally to humans.

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