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Prevalence and distribution of gastrointestinal helminths in free range chickens in Mashhad, northeast of Iran

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Abstract. A cross-sectional study was conducted to determine the prevalence, intensity, and species of gastrointestinal helminths of free-range chickens in Mashhad, Northeast of Iran. From December 2011 to August 2012, one hundred free range chickens were collected from different regions of Mashhad in Northeast of Iran and gastrointestinal tracts were inspected for adult helminths. Seventy-two percent of the chickens were found as infected with gastrointestinal helminths. Species and prevalence of the helminths were as follows: *Ascaridia galli* (29%), *Heterakis gallinarum* (23%), *Heterakis isolonche* (9%), *Subulura brumpti* (3%), *Raillietina tetragona* (15%), *R. echinobothrida* (11%), and *Choanotaenia infundibulum* (4%). No trematodes were found. Sixty four percent of chickens had multiple infections while 22% were suffering from single infections. As far as prevalence and mean intensity of infections were concerned, there was no difference between male and female birds. These results confirm the high risk of helminth infections in free range systems and may explain one of the causes of high mortality in them.

Keywords: Chicken helminthic infections; Prevalence; Gastrointestinal; Mashhad; Iran.

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Introduction

Traditional free range chickens are of great economic importance in rural areas of small communities all over the world. Chickens and eggs provide an important source of animal protein for poor families and can give small cash income when sold at the market. Several reasons such as mismanagement, malnutrition, diseases and predation have been suggested for the low productivity and high mortality (Minga et al., 1989; Negesse, 1993). Parasitic diseases in rural chickens are common due to scavenging habits in free range (Soulsby, 1982; Pandey et al., 1992; Permin et al., 1997).

In general, information about the geographical distribution of parasitic diseases and the impact of parasites on mortality and productivity in free range chickens in Iran is

still very limited (Eslami and Anwar, 1973; Nabavi et al., 2005; Naem and Eskandari, 2005; Eslami et al., 2009; Mamashly et al., 2011). This cross-sectional study was conducted to determine the species, prevalence and intensity of gastrointestinal helminths in free range chickens in the different regions of Mashhad, Northeast of Iran.

Materials and methods

Chickens were collected from 10 neighboring villages in the central region of Mashhad in Northeast of Iran. Animal farming in small holdings was conducted by rearing primarily poultry, sheep and cattle as well. The study population was chosen from these rural free range chickens *(Gallus gallus).* Chickens were permitted to roam without being fenced in any way during the daytime when they scavenge around to obtain food from the surroundings and kept indoors during the night in small poultry yards or together with the family. The feed might be supplemented by household wastes and cereals.

Sample size was calculated according to Thrusfield (1995). As the prevalence of the parasites was unknown, each was assumed to be 50% where the maximum sample size was calculated. With a desired absolute precision of 10% and a 95% level of confidence, a sample size of at least 96 birds was required. From December 2011 to August 2012, a total of 100 local chickens, apparently healthy including both sexes, of different age group were randomly bought from the respective study areas. Following euthanasia, the gastrointestinal tract from the esophagus to the rectum, including both caecal tubes, was removed from the body cavity of each chicken and then opened longitudinally with scissors according to Permin and Hansen (1998).

The crop, the proventriculus and the gizzard were examined directly for the presence of *Gongylonema ingluvicola*, *Tetrameres* spp. and *Acuaria hamulosa*, respectively. The mucosa and contents of the intestinal tract were then scraped twice with tweezers to obtain adhering parasites in the mucosal layer. The scrape-off was washed in a 90 mm mesh sieve under running tap water and the content of the sieve transferred to a Petridish. The contents of the gastrointestinal tract were then carefully assessed with the naked eyes as well as under a stereomicroscope. All worms were transferred into 70% alcohol for preservation and later identification. The identification was carried through following the key of Soulsby (1982).

The prevalence, mean intensity, and abundance were calculated according to the definitions of Margolis et al. (1982). Associations between prevalence of each parasite species and host sex were made using the Chi-square and Fisher exact test. Data was analyzed and statistical comparisons were performed using SPSS 16 with $p<0.05$ considered as significant.

Results

Seventy-two percent of the chickens were infected with gastrointestinal helminths. The species and prevalence were as follows: *Ascaridia galli* (29%), *Heterakis gallinarum* (23%), *Heterakis isoloncheе* (9%), *Subulura brumpti* (3%), *Raillietina tetragona,* (15%), *Raillietina echinobothrida* (11%), and *Choanotaenia infundibulum* (4%) (table 1). No trematodes were found. Mixed infections accounted for 64% as compared to 22% infections with a single worm. The 60 female and 40 male chickens had similar average number of helminth species: 4.17±1.5 (SD) and 4.24±1.6 (SD), respectively. The intensity of infection was highest for *A. galli* with an average of 12±3.9 worms per hen. Average worm counts for *H. gallinarum*, *H. isoloncheе* and *S. brumpti* were 5±1.8, 5±1.4 and 4.1±1.7 worms per hen, respectively (table 1). Additionally, the hens harboured average of 2.5±1.4, 2.6±0.9 and 2.1±0.6 worms for *R. tetragona, R. echinobothrida* and *C. infundibulum,* respectively (table 1). No significant differences in the abundance and intensity of helminth infection were observed between male and female chickens. The difference was not significant between the prevalence of helminths infections and the sex of chickens ($p>0.05$).

Table 1. Prevalence, abundance, mean intensity ±SD, and range of helminth species found in 100 free range chickens in Mashhad, Iran (2011-2012)

Host infested	Male	Female	Total infested	Prevalence (%)	Abundance	Intensity ± SD	Range
• Nematodes							
Ascaridia galli	12	17	29	29	1.2	12±3.9	7–22
Heterakis gallinarum	9	14	23	23	0.5	5±1.8	3–9
Heterakis isolonche	2	7	9	9	0.1	5±1.4	3–7
Subulura brumpti	1	2	3	3	0.2	4.1±1.7	1–7
• Cestodes							
Raillietina tretragona	7	8	15	15	0.2	2.5±1.4	1–5
Raillietina echinobothrida	5	6	11	11	0.3	2.6±0.9	1–5
Choanotaenia infundibulum	1	3	4	4	0.1	2.1±0.6	1–3

Discussion

This study revealed a prevalence of 72% helminth infection in free range chickens, suggesting that domestic fowls maintained under the village production system may be subclinically infected.

The results are lower than those reported by Eslami et al. (2009) and Mamashly et al. (2011), who reported 96% and 92.73% prevalence from Golestan province, respectively. The differences in the prevalence of gastrointestinal helminths of free range chickens between this study and the above studies might be associated with ambient temperature, high rainfall, and humidity and altitude differences in the respective study area. Although gastrointestinal helminths of free range chickens are widely distributed throughout the world, the rate of infection is particularly common in countries with temperate climates and in the highlands of tropical and sub-tropical countries (Abdelqader et al., 2008; Katoch et al., 2012).

In this study, *A. galli* was the most frequent species of helminths (29%) that agrees with the previous reports (Eslami and Anwar, 1973; Nabavi et al., 2005; Naem and Eskandari, 2005; Eslami et al., 2009; Mamashly et al., 2011) from different parts of Iran and also other regions of the world (Abdelqader et al., 2008; Matur et al., 2010; Katoch et al., 2012). *A. galli* has a major effect on the health of chicken by sharing feed thus causing low productivity and stunted, which may be related to damage to the intestinal mucosa (Permin et al., 1997). Sometimes the parasite can found in the abdominal cavity after penetrating the intestinal wall and causing major inflammation to the mucosa which interfere with the absorption of food (Urquhart et al., 1987). All the above studies indicated that Ascaridiosis is a significant parasitosis of local chicken in all part of Iran, hence, firm measures should be undertaken to control this economically important parasite.

Moreover, *H. gallinarum* was another most frequent species of helminths. Little pathology is mentioned by this cecal worm (Gordon and Jordan, 1982). However, it can act as a carrier of *Histomonas meleagridis* in turkeys and chickens (Urquhart et al., 1987). On the other hand, only few free range chickens in this study were infected with other gastrointestinal helminths e.g. *H. isolonch, S. brumpti*, *R. tetragona*, *R. echinobothrida* and *C. infundibulum.* Reasons might be the geographical variations in the distribution of the parasites or the intermediate hosts of the worms. Although similarities were observed with helminths reported elsewhere, neither helminths of the gizzard nor *Capillaria* species were found in our study. The geographical area or the intermediate hosts of the worms may explain the fewer species reported. If the study were extended more to include many districts of the country, more species might be found. Additionally, in agreement with other authors in the region, no trematodes were found (Eslami et al., 2009; Mamashly et al., 2011). The failure to isolate trematodes in this study might be due to the absence or lesser occurrence of the snail intermediate hosts

responsible for transmission of trematodes in the study area. Parasitic cestodes such as *R. echinobothrida*, *R. tetragona* and *C. infundibulum* in poultry are known to cause retarded growth, enteritis, diarrhea and hemorrhages (Gordon and Jordan, 1982). Heavy infections may cause death of young birds apart from the loss of egg production in laying chickens. *R. echinobothrida* is considered to be harmful due to the formation of nodules in the intestinal wall, which can lead to confusion with lesions of avian tuberculosis (Calnek et al., 1991).

In this study the vast majority of the birds harboured multiple species infections of helminthes, which suggests that the prevailing environmental conditions and free range management systems are favorable to their simultaneous development. It is recommended that the pathogenicity of the mixed infections observed in free range chickens in this study needs to be evaluated. There was no significant difference in infection rate between male and female animals. The present study confirms the findings of other studies (Poulsen et al., 2000; Abdelqader et al., 2008; Mamashly et al., 2011) which reported no difference in the intensity of infection in male and female cats. Sex seemed to have no effect on prevalence of parasitism.

According to the findings of this study and other reports (Eslami et al., 2009; Mamashly et al., 2011), domestic chickens feed in a wide area therefore, they are more predisposed to worm infections. This could be the likely reason for the higher infections in the free range chickens which continue to accumulate parasites. Poor management practices might be the next likely reason. In conclusion, more attention should be focused towards the improvement of the poultry management and care of local breed of chickens which are usually free ranging. It may be necessary in the future studies to quantify the possible relationship between helminth infections, rate of weight gain and egg laying in free range chickens.

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