

Prevalence of *Passalurus ambiguus* in domestic rabbits (*Oryctolagus cuniculus*) in Karbala province, Iraq

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Commercial rabbit farming is primarily focused on the production of rabbit meat, although the presence of gastrointestinal disorders can impede their productivity. Endoparasites significantly contribute to the development of several diseases in rabbits, leading to higher rates of illness and death. *Passalurus ambiguus* is a widely distributed nematode that commonly infects the intestines of rabbits and hares. Parasitic disease can have a substantial economic impact on the industry by reducing the commercial value of rabbit meat and skins, impeding growth and development, and leading to mortality. This study aims to examine the frequency of gastrointestinal parasites in domestic rabbits that are bred in Karbala province, Iraq. Throughout the trial, fecal samples were collected from a randomly selected group of 48 live rabbits. The feces are collected directly from the anus of each living animal. The samples were tested and the presence of eggs and nematodes was detected in the infected samples. Analysis of samples was carried out at the Parasitology Laboratory, college of Veterinary Medicine, Kerbala university, using the flotation technique. Feces from 48 rabbits (ages 1-2) years. The feces are taken out of each animal directly from the anus. Upon testing, it was found that 16 out of 48 fecal samples, accounting for a prevalence of 33.33 %, were infected with at least one nematode. Chi-square (χ^2) statistics. Age and genders are not statistically significant at P values ≥ 0.05 . This study identified the presence of *Passalurus ambiguus* in rabbits of varying ages residing in Karbala region, Iraq, including both male and female domestic rabbits. Determining the age and gender of rabbits affected by passalurosis would enable the management of the infection level in these animals. Regular use of a consistent and dependable diagnostic method is essential in industrial rabbit farms to detect and monitor gastrointestinal parasite illnesses. Gastrointestinal parasites continue to be significant health issues that lead to the mortality of rabbit litters in production. Stress and a reduction in immune response may be crucial factors driving this phenomenon.

Keywords: *Passalurus ambiguus*, Rabbit, Iraq.

Поширення *Passalurus ambiguus* серед домашніх кролів (*Oryctolagus cuniculus*) у провінції Кербела, Ірак

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Сучасне промислове кролівництво орієнтоване на отримання м'ясної продукції від кролів. Слід зазначити, що наявність у кролів шлунково-кишкових розладів є чи не першою проблемою, яка істотно знижує продуктивність цих тварин. Ендопаразитарні захворювання сприяють появі у кроликів супутніх захворювань, або ж значною мірою ускладнюють перебіг вже наявних, що найчастіше призводить до необоротних змін в організмі тварин та досить високого рівня летальних випадків. *Passalurus ambiguus* – надзвичайно поширений гельмінтоз, викликаний нематодою, що зазвичай вражає товстий відділ кишечника кроликів і зайців. Захворювання домашніх кролів на пасалуроз має суттєвий економічний вплив на галузь, за інвазування кролів *P. ambiguus* тварини відстають у рості та розвитку, зменшується комерційна цінність кролячого м'яса та отримувана шкіряна сировина, подекуди хворий молодняк гине. Це дослідження спрямоване на вивчення поширення шлунково-кишкових паразитів у домашніх кроликів, яких розводять у провінції Кербела, Ірак. Проведений аналіз зразків від кролів у віці від 1-го до 2-х років, що здійснювався в умовах лабораторії паразитології Ветеринарного коледжу університету Кербела, засвідчив значне поширення пасалурозу серед досліджуваного поголів'я кролів. Встановлено, що екстенсивність пасалурозної інвазії в умовах кролівничих господарств провінції Кербела становила 33,33 %. Визначено, що вік і стать не є статистично значущими при значеннях $P \geq 0,05$. Отже, проведеним дослідженням визначено наявність у домашніх кроликів (*Oryctolagus cuniculus*) нематоди *Passalurus ambiguus*. При цьому встановлено, що хвороба реєструється у тварин як різного віку, так й статі. Проведений аналіз має як теоретичну, так й практичну цінність, адже визначення вікової та сезонної динамік за пасалурозної інвазії у кроликів дозволить контролювати рівень інвазії.

Ключові слова: *Passalurus ambiguus*, кролі, Ірак

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Introduction

Domestic rabbit (*Oryctolagus cuniculus* var. *domesticus*) produced from wild industry, it was domesticated in past and cultivated to production meat and fur [10]. Domestic rabbits are reared commercially for their meat while intestinal infections can disturb their production [21]. Wild rabbits and hares are representing a natural hosts or carriers of many parasitic nematodes and bacterial zoonotic infections [4]. One of the most common nematodes is *Passalurus ambiguus*, a pinworm parasite, infects both wild and domestic rabbits, hares, and rodents globally [1, 26]. It characterized by cosmopolitan, focused in the extensions and large intestine. The disease called (Passaluriasis or Passalurosis) is still a significant effect in modern rabbit breeding, due to the infection is highly contagious and spreading causing abnormal economic losses [12, 13, 26].

The dissemination of nematodes is due to the specificity of the life cycle of parasites, and this feature in the lifestyle nematode was accompanied by the many of biological adaptations that expedite the nematodes existence, evolution and proliferation in different environments [26].

Passalurus ambiguus and *Eimeria* spp. are the more commonly confirmed gastrointestinal parasites. *P. ambiguus* is regarded non-pathogenic for adult rabbits, while more pathogenic in youngsters can cause a heavy infection leading to the enteritis [19]. Other clinical signs in rabbit farm in Greece were reported: itching around the anus, digestion disorders, loss of weight, diarrhea, weight loss, depression, ruffled furs, in appetite, dehydration, and in severe cases, death, while, infected rabbits were recorded to be moderately to heavily infestation with *P. ambiguus* [22].

A significant spread of passaluriasis is assisted by the progressing coprophagy, which is a frequent physiological procedure in rabbits. Particularly, female nematodes can lay eggs around the anus on the skin [12]. Coprological method or other diagnostic technique should be used continuously in rabbit farms to discover gastrointestinal parasitic [22]. Other study in the local animals market in Al-Diwaniyah province, Iraq, in wild rabbits *Oryctolagus cuniculus* was explained the important role of rabbits in the transfer of ecto-endoparasites as a reservoir and/or a vector host. Of 55 samples of wild rabbits, 18 rabbits are infected with *P. ambiguus* (32.73 %).

A significant role of rabbits in the dissemination of parasites and possibility infection of humans and other animals [16]. In Mosul, Iraq, mixed infection was more frequent during examination 23/30 (76.6 %) of domestic rabbits, with prevalence of nematodes was 52.1 % [2].

The purpose of the study

This study aims to examine the frequency of gastrointestinal parasites in domestic rabbits that are bred in Karbala province, Iraq.

Materials and methods

The samples have been collected continuously every week 01.09.2023–30.10.2023. Fourty eight live rabbits are found in local markets in Karbala province, Iraq.

During the sampling all animals are examined alone for ectoparasites or other infections. Feces from 48 rabbits (ages 1-2) years. The feces are taken out of each animal directly from the anus. Then, after sampling the materials are transferred to lab of veterinary parasitology, college of veterinary medicine, university of Kerbala. The materials were examined for the presence of nematodes from the infected animals.

Using a faecal flotation technique [22].

Faecal samples were analyzed by flotation method for separating and detecting concentrating egg of parasites. About (3-4 g) of faecal samples were investigate by flotation method [17]. Using a density hydrometer, 800 ml of distilled water and 210 g of NaCl were combined to create the flotation solution, which had a specific gravity of 1.2–1.3. Using a vortex, each sample was thoroughly homogenized with 15 ml of the sodium chloride solution in 50 ml preparation tubes (sealing caps included). A strainer was used to filter the suspension into a 12 ml centrifuge tube, which was then filled and centrifuged at 300 g for 8 to 10 minutes. After that, flotation solution was poured into the tube to create a convex meniscus at the top. After ten minutes, a coverslip was gently pressed against the meniscus, removed, and put on a glass slide for microscopic inspection. The prevalence of infection was calculated according to [15].

Statistical analysis: The Chi-square (χ^2) test was used between all results. $P \leq 0.05$ were considered significant statistically.

Results and discussion

Among 48 domestic rabbits used in this study 16 (33.33 %) as a total prevalence. The infection in male 9 (56.3 %) while in female 7 (43.8 %) were infected to at least one of the parasitic nematode. There are no Significant effects were observed between males and females ($P \geq 0.05$), (*Table 1; Figs. 1*).

Table 1
Prevalence and relation with Sex

Infected * sex Crosstabulation					
Parameters		sex		total	
		male	female		
Infected	Non-infected	N	14	18	32
		%	43.8	56.3	100.0
	Infected	N	9	7	16
		%	56.3	43.8	100.0
Total	N	23	25	48	
	%	47.9	52.1	100.0	

$\chi^2 = 0.668$ Sig = 0.414

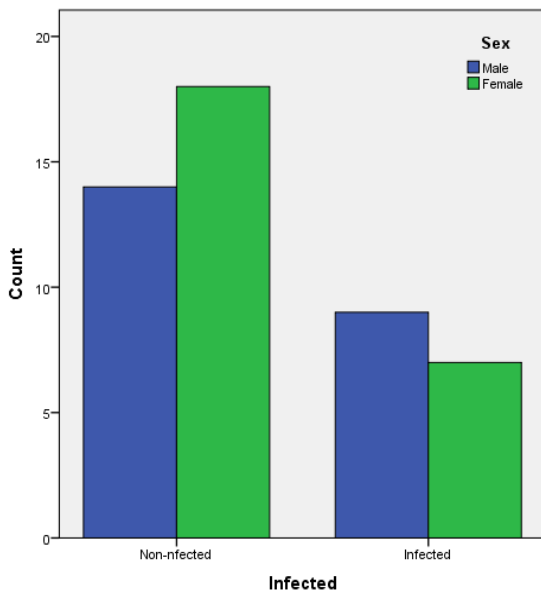


Fig. 1. Relation and distribution of sex with infection

The nematode has been detected males and females. The morphologic features are detected in both genders. Females are characterized by larger than males. Both of them have mouth, esophagus with cylindrical form and two bulbous and narrow region between bulbous and Intestine.

Among infected rabbits in Karbala province, Iraq, were detected by coprological parasitological analysis as easy, simple, less cost and less of time. There are two group of ages; first group (1year) and second group (2 years). The infection rate in one year was 10 (31.3 %); while infection rate in (two years) was 6 (37.5 %). There are no Significant effects were observed between ages ($P \geq 0.05$) (Table 2; Figs. 2).

Table 2

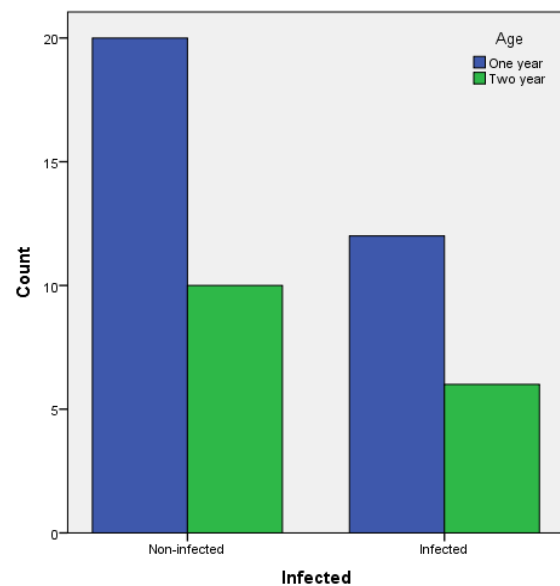
Prevalence of infection with Ages

Parameters	Infected		Total	
	non-infected	infected		
Age	N	22	10	32
	%	68.8	31.3	100.0
2 year	N	10	6	16
	%	62.5	37.5	100.0
Total	N	32	16	48
	%	66.7	33.3	100.0
$\chi^2 = 0.188$		Sig = 0.665		

Rabbits are one of the more usually laboratory animals, employed all around the world in experiments to assess various biological examinations [20]. Helminthiasis is a parasitic nematode infection that has resulted in financial loss and involves certain risk factors [11]. Passalurosis of rabbits is a prevalent disease among helminthiasis of domestic rabbits in all over the world [26].

In this study, the total prevalence was (33.33 %). This agreement with other studies are reported (*Passalurus ambiguous* 18/55 (32.73 %) of wild rabbits from both genders with various ages from the local market in Al-Diwaniyah province, Iraq [16]. Other study refer to the

prevalence was 65/195 (33.2 %) in rabbits of the German Uriah breed from a farm in Făget, Timiș county, Romania, from 288 faecal samples were collected using the flotation method [23]. While in the Poltava region the total prevalence of passalurosis was reach to 29.64 % [14], and disagreement with other studies in Ukraine the total incidence infestation of rabbits passalurosis was (16.87 %) [7]. In Mosul/Iraq [2], who first reported *P. ambiguous*, 12/23 (52.1 %), of 30 of domestic rabbits of both genders at different ages. These differences in prevalences may be related with other factors as number of examined animals, location, examination methods, concurrent infections, genders, ages, geographical area, strains and type of breeding.



Figs. 2. Relation and distribution of age with infection

Although the parasite is localized in the cecum and colon of rabbits, but is cosmopolitan, unlimited spread and highly contagious because the biological features of *P. ambiguous*, such as the characteristic that the greatest possible preservation of parasitic nematodes at exogenous stages of their life cycle [26]. Parasitic diseases are one of the most factors that result in a decline in the rabbit breeding industry's profitability. Infestations can result in financial losses such as decreased fat content and live weight loss in rabbit carcasses, along with a decline in skin quality [14]. One among the most diagnostic methods have been used carpological methods like direct smear and flotation methods for initial diagnosis and identifying of characteristic features. Brustenga et al, 2023 [3] were detected the prevalence of *P. ambiguous* was 20/215 (9.3 %) in fecal pools collected in (eight) various breeding facilities were examined by quantitative and qualitative coprological techniques. In this study we used coprological methods to detect and identify of the parasites in both eggs and adults. Fulleborn flotation technique was used on (100) domestic rabbits raised in Kirikkale and Ankara regions, Turkey. The prevalence of the *P. ambiguous*, was (2 %) [6]. Other study was used flotation method in detect of nematodes on 15 young rabbits and 25 adult rabbits from, Karo Dist rict, Sumatera Utara, Indonesia. The total prevalence was (13.33 %) [25].

While in the present study microscopic direct smear was more useful to detect parasite don't differ from flotation method. Fifty-one domesticated New Zealand White rabbits were analyzed by three copromicroscopic techniques the cellophane tape test 39 (76.5%), 29 (56.9%) the McMaster technique, and 42 (82.3%) the FLOTAC technique [21].

The adults have rounded or spherical (bulbus) at the end of esophagus [19] who used microscopical identification to detect nematodes out of 10 rabbits in Poltava Oblast (Ukraine) by detect A rounded projection (bulbus) near the end of the esophagus is a characteristic shared by mature worms of this species. Additionally, [12], was identifying morphological species by detection not only a spherical bulb in the esophagus but founding of three teeth in the oral capsule. Males have a characteristic structure of the tail end, papillary protrusions and highly narrowed portion with a spicule handle. Females have two different forms short-tailed and long-tailed. In advance of morphological diagnosis in Egypt [9], who described morphologically in 90 out of 200 domestic rabbits. Using light and scanning electron microscope for adult worms and showed a transverse cuticular striations, the dorsal and ventral surface have four papillae and the mouth was surrounded by three teeth and triangular form.

In this study there is no significant differences between genders and among different ages. This study corresponding with studies as [2], who recorded no significant differences showed between genders and ages in Mosul, Iraq. Other researcher from Upper Egypt in domestic rabbits have resulted non-significant ($P>0.05$) of age, sex and breed, these differences refer to younger animals are generally more susceptible to helminthiasis in comparison with adults. These results in this study may be showed the fact of prevalence of contamination with this nematode randomly and may be a risk factor for rabbits breeding and production in addition to economic losses.

In Karo Dist rict, Sumatera Utara, Indonesia. Rabbit feces samples were as 40 rabbits using the flotation method. The results showed that the young animals more risk than adult with prevalence (13.33%) (Tanjung et al., 2019). Other study by [23], in Făget, Timiș county Romania, revealed that juvenile rabbits are more susceptible to nematodic infections with *P. ambiguus* than adult rabbits. The most affected by gastrointestinal parasites were the rabbits ≤ 2 months and ≤ 4 months ($P<0.0001$), in opposition to the other two age groups, 4–6 months and > 12 months, respectively [18] who recorded genders have non-significant between males and females of the wild rabbit (*Oryctolagus cuniculus*) in Navarra (northern Spain). In Iran, Non-significant was recorded for genders in nematode infections in animal house among them (rabbits) of Shiraz University of Medical Sciences [24]. Also, in North West of Iran, New Zealand White rabbits from suburbs of Urmia and Tabriz, were recorded non-significant impact of infection rate between male and female rabbits [8]. So that our results in addition to this study believes that may be rabbits play important role in the dissemination of parasites and transfer infection to Human and other animals.

Conclusions

Passalurosis ambiguus infestation is a prevalent nematode disease in rabbit farms in karbala province, with a parasitic infection rate of 33.33% among rabbits. A definitive identification of the pinworm species infecting domestic rabbits has been diagnosed as *P. ambiguus*. The results in the present research refer to prevalence of (*P. ambiguus*) in domestic rabbits Karbala province, Iraq. Gastrointestinal parasites are considering one of the pathogens that cause significant effects on the health of rabbits. Initial and routine continuous diagnosis should be made to control and prevent development of parasitic infection. Many studies should be make on this nematode to identify the prevalence of infection in both domestic and wild rabbits in all of the Iraq.

Conflict of interest

The authors declare no conflict of interest.

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Ethical Statement

Ethics required are approved by the Ethical Committee of college of veterinary medicine/ university of Kerbala under acceptance number- UOK.VET.MI.2022.066.

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