



Prevalence and pathological study of trichomoniasis in the racing pigeons in Mosul city, Iraq

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Abstract

This study aimed to survey the prevalence of trichomoniasis in homer pigeons in Mosul, Iraq, relating to gender and age based on pathological changes. A visual examination was performed for 2561 birds (1264 male and 1287 female), with 1547 birds aged less than one year and 1014 birds aged more than one year from October 2022 to January 2023. The results revealed A total of 2561 racing homer pigeons, 185 (7.2%) with gross lesions of trichomoniasis in the rate of 56 birds positive for Giemsa stain (30.3%) as 27 males (48.2%), 29 females (51.8%), 38 birds less than one-year (67.9%) and 18 (32.1%) birds more than one year. Grossly, there were variable sizes of yellow necrotic masses and ulcers beside the mouth, eye, oral mucosa, pharynx, and esophagus. The Histopathological changes of the oral mucosa, esophagus, crop, and proventriculus revealed accumulation of necrotic material infiltration of inflammatory cells, whereas in the liver were severe as multiple necrotic inflammatory foci. The study concluded that trichomoniasis was equally reasonably common in male and female homer pigeons in the Mosul city neighborhoods, Iraq. Some pigeons were infected despite the negative result, and the infection was more common in younger than mature birds.

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Introduction

Domestic pigeons are bred near people and used as a source of protein, as a hobby, as a sign of peace and love, in competitive sports, and most recently as experimental animals (1); racing homer pigeons are susceptible to a variety of diseases, including canker (trichomoniasis), a parasitic disease caused by an anaerobic flagellum protozoa parasite. The parasite's scientific name is Gallinae trichomonas, a pear- or round-shaped protozoan parasite with a length of 12.5 to 20 nm. The organism has a distinct axis, four anterior flagella, and no free posterior flagella. It projects posteriorly and waves on a well-developed membrane (2). Canker in pigeons is the name of the disease, which results in emaciation and dehydration as a result of necrotic lesions and various infections that develop in the mouth and gullets and inhibit swallowing (3,4). The trichomoniasis parasite does not have a mediating host and multiplies by binary fission,

causing pathological lesions in the respiratory system, particularly in the pharynx, and digestive system, particularly in the esophagus, which results in death from starvation and suffocation (5). However, it can spread vertically through crop milk when pigeons nurse their young chicks through a process known as oozing and horizontally through shared food and water supplies (6,7). *T. gallinae*, the parasite that causes trichomoniasis, has a direct life cycle because it spreads from one host to another without the aid of an intermediary host or a peer host. The parasite does not go through cystic phases. Depending on the salinity of the water, this parasite can survive in it for 20 minutes to several hours or at least five days. This parasite can persist in dead pigeon carcasses in wet grain for up to 48 hours (2). Additionally, trichomoniasis infection can happen without any outward symptoms or Anorexia; vomiting, flying feathers, diarrhea, dysphagia, shortness of breath, weight loss, and increased thirst are only a few of the mild symptoms

of this illness that cause death (4). In more severe cases, it may be difficult to close the mouth, foul-smelling liquids leak from it, the mouth expands, and thin white membranes form over the eyes due to sinusitis (8).

This study aimed to conduct a survey study of the prevalence of the canker disease (trichomoniasis) in homer pigeons in the city of Mosul, Iraq, relating to the factors of gender (males and females) and age (less and more than one year), based on clinical signs, smears, gross pathological and histopathological changes.

Materials and methods

Ethical approve

The samples of the trichomoniasis homer pigeons were obtained randomly from Mosul city, Iraq. It depends upon the Permit of the College of Veterinary Medicine, University of Mosul in the form number 1565 at 1/9/2022.

Table 1: Total homer pigeons' numbers according to sex and age

| Total examined | Sex [n(%)] | | Age [n(%)] | | Accurate smears of gross changes |
|----------------|--------------|--------------|------------|----------|----------------------------------|
| | Male | Female | > 1 year | < 1 year | |
| 2551 | 1264 (49.5%) | 1287 (50.5%) | 1547 | 1014 | 185 (7.25%) |

Direct, unstained, wet swabs

Grossly trichomoniasis-infected birds were examined, and 156 moist swabs were gathered from the oropharyngeal cavity, trachea, esophagus, and liver. After several drops of phosphate-buffered saline were added, the swab was spread out on the glass slide designated for microscopic examination. This slide was then placed under a light microscope at 40X magnification for microscopic examination (9).

May Grunwald Giemsa stain

Smears stained with the May Grunwald Giemsa stain procedure (10). The parasite is identified by the research's description (11).

Acridine orange stain

The slide smears immersed in absolute methyl alcohol were thoroughly dried after being submerged in a working acridine orange solution 0.01% for five minutes. The stained slides were then gently rinsed with water, allowed to air dry completely, and examined under a fluorescent microscope using a Green G filter.

Table 2: Case investigations percentage of total homer pigeons' numbers, smears, sex, and age

| Total | Total smears of the gross lesions | Total positive | Real negative consequences | Sex | | Age | |
|-------|-----------------------------------|----------------|----------------------------|------------|------------|------------|------------|
| | | | | Male | Female | >1 year | <1 year |
| 2561 | 185 (7.2%) | 56 (30.3%) | 129 (69.7%) | 27 (48.2%) | 29 (51.8%) | 38 (67.9%) | 18 (32.1%) |

Cases investigation and prevalence

To study trichomoniasis in racing homer pigeons in Mosul, Iraq, random regions of the city were visited regularly, as well as organized trips to the homes of pigeon breeders. A visual examination was performed for a total of 2561 birds (1264 male and 1287 female), with 1547 birds aged less than one year and 1014 birds aged more than one year from October 2022 to January 2023 for the presence of Symptoms, clinical signs and gross lesions (Table 1).

Symptoms, clinical signs, age and gender

Symptoms and clinical signs and symptoms were recorded.

Gross pathological changes

The recently deceased birds and those exhibiting trichomoniasis clinical symptoms were necropsied and documented.

Histopathological examination

All suspected samples with trichomoniasis that had both clinical signs and gross lesions from the oral cavity, esophagus crop, proventriculus, trachea, and liver were fixed in a 10% neutral buffered formalin. Then, the hematoxylin and eosin staining protocol was done (12).

Results

Cases investigation and prevalence

Of a total of 2561 racing homer pigeons, 185 (7.2%) showed gross lesions of Canker disease in the rate of 56 birds positive for Giemsa stain (30.3%) as 27 males (48.2%), 29 females (51.8%), 38 birds less than one-year (67.9%) and 18 (32.1%) birds more than one year (Table 2).

Symptoms, clinical signs

The clinical signs and symptoms of the infected homer pigeons were stopped eating, fluffed-up plumage, emaciation, depression, difficulty swallowing with salivation, increased water intake, and respiratory distress.

Gross pathological changes

Grossly homer pigeons with trichomoniasis were variable size of yellow necrotic masses and ulcers beside the mouth, eye, oral mucosa, pharynx, and esophagus rapidly growing and merging to form groups that frequently completely obstruct the esophagus and may prevent the bird from closing its mouth, and a lot of fluid may accumulate in the mouth, in some cases Watery secretions are observed in the eye, and more advanced stages, secretions are monitored around the eye (Figure 1).

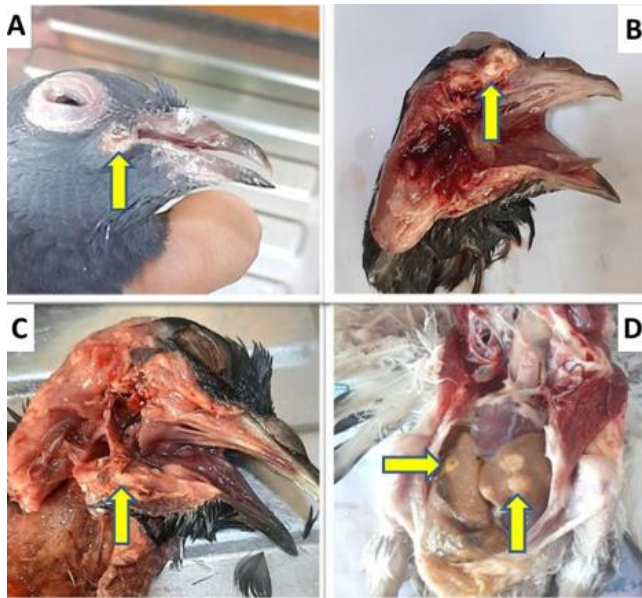


Figure 1: Grossly, homer pigeons with trichomoniasis, (A, B and C): variable size of yellow necrotic masses and ulcers beside mouth, eye, oral mucosa, pharynx and esophagus. (D): yellow-white necrotic foci areas in the liver.

Microscopic diagnosis

In the direct, unstained, wet swabs, the parasite was identified by its pear-shaped and jerky movement, which is characteristic of the parasite resulting from the direction of the undulant membrane, as well as from the direction of the anterior flagella of the parasite (Figure 2). Whereas the May Grunwald Giemsa stain slides revealed the microscopic structure of the parasite as pear-shaped, light pink-blue cytoplasm, and dark pink color of the nucleus relating to the severity of the infestation (Figure 2). A section of Acridine orange AO stain by fluorescence microscope of a homer pigeon with Trichomoniasis showed the luminescent pear-shaped parasite (Figure 3).

Histopathological changes

The histological sections of the oral mucosa revealed mucosal necrosis and loss and infiltration of inflammatory cells. The esophagus lesions were necrotic material in the

submucosa, infiltration of inflammatory cells, and necrosis of the mucous gland. The crop showed an accumulation of necrotic material in the mucosa (Figure 4).

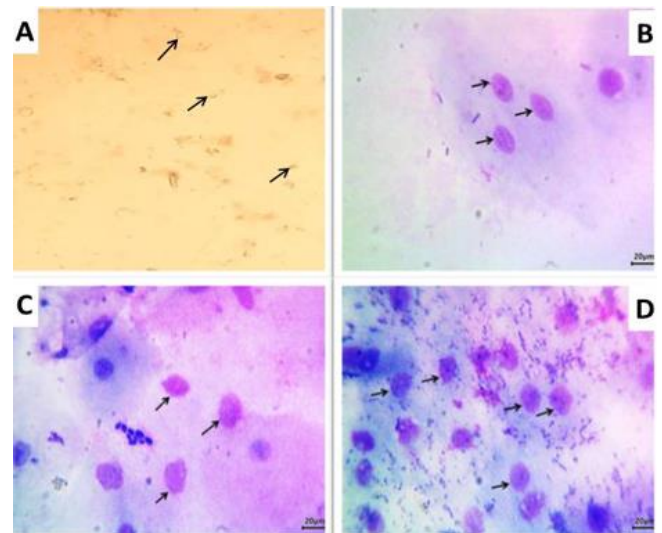


Figure 2: A smear sections of a homer pigeon with Trichomoniasis. (A): Direct, unstained, wet swabs as pear-shaped and jerky movement of the parasites (arrows). (B, C & D): May Grunwald Giemsa stain showing the pear-shaped parasite light pink color cytoplasm, and dark pink color of the nucleus (arrows) relating with severity of the infestation (B: mild; C: moderate and D: severe). 1000X.

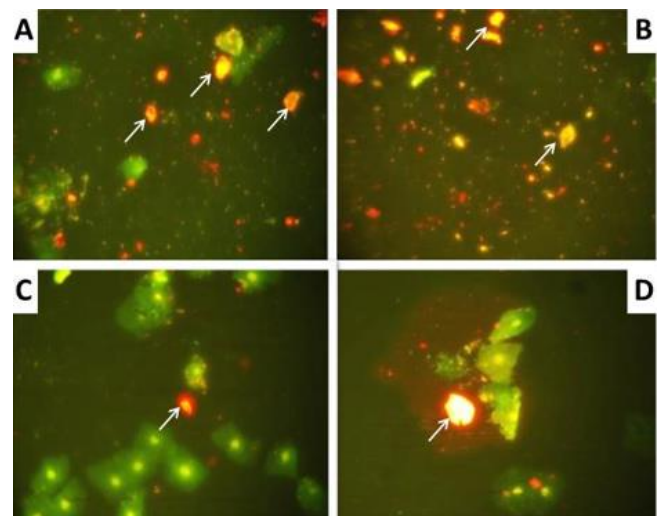


Figure 3: A sections by fluorescence microscope of a homer pigeon with Trichomoniasis. (A & B): from the lesion's swabs and (C & D): from liver swabs showing the luminescent pear-shaped parasite (arrows). Acridine orange stain, 500X.

The lesions of the proventriculus were an accumulation of necrotic material in the lumen, mucosa, and submucosa. The trachea revealed inflammatory foci with heterophils and mononuclear cells in the lumen, necrosis of the mucous glands, and the cartilage (Figure 5).

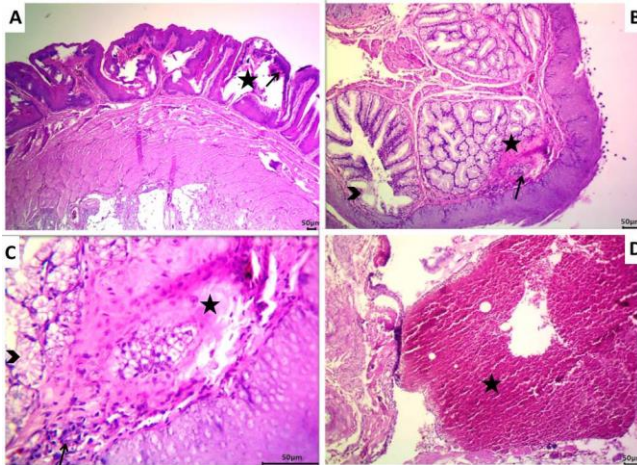


Figure 4: Histological sections of a pigeon with trichomoniasis. (A): oral mucosa, mucosal necrosis and loss (star) and the infiltration of inflammatory cells (arrow). (B & C): Esophagus, necrotic material in the submucosa (star), infiltration of inflammatory cells (arrow) and necrosis of mucous gland (arrowhead). (D): Crop, accumulation of the necrotic material in the mucosa (star). H&E. (A: 40X; C:400X; B&D:100X).

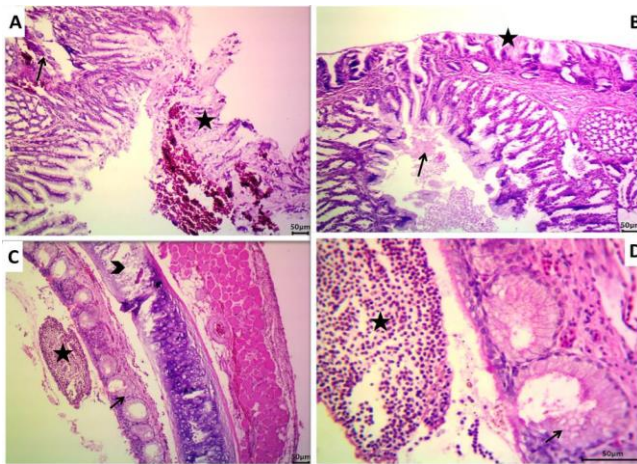


Figure 5: Histological sections of a pigeon with trichomoniasis. (A&B): Proventriculus, accumulation of the necrotic material in the lumen and mucosa (star) and submucosa (arrow). (C&D): Trachea, inflammatory foci with heterophils and mononuclear cells in the lumen (star), necrosis of the mucous glands (arrow) and necrosis of the cartilage (arrowhead). H&E. (A: 40X; B&C:100X; D:400X).

The histopathological changes of the liver were in a variable severity as multiple necrotic inflammatory foci with caseation and inflammatory exudate surrounded by a zone of polymorph and mononuclear inflammatory cells with giant cells and severe diffuse necrosis of hepatocytes (Figure 6).

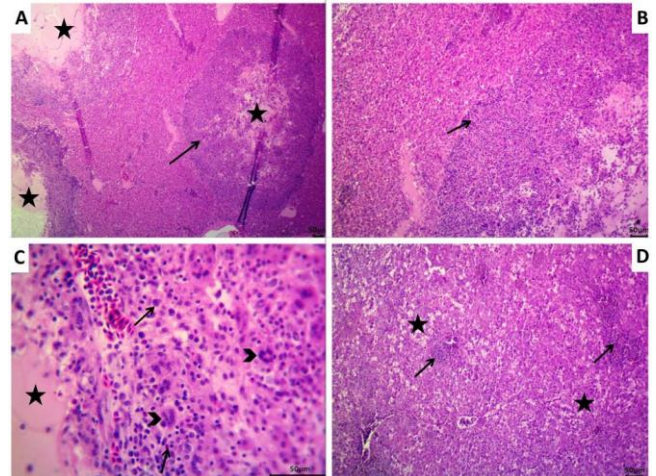


Figure 6: Histological sections of a pigeon with trichomoniasis. (A, B & C): liver, multiple necrotic inflammatory foci with caseation and inflammatory exudate (star) surrounded by zone of polymorph and mononuclear inflammatory cells (arrow) with giant cells (arrowhead). (D): severe diffuse necrosis of hepatocytes (star) and infiltration of inflammatory cells foci (arrow). H&E. (A: 40X; B&C:100X; D:400X).

Discussion

Wet swabs from the mouth and crop of infected birds were used to isolate the parasite, and laboratory tests were then carried out on them using the technique above (9). The direct, unstained, wet swab demonstrated the parasite's distinctive vibrating movement caused by the movement of the anterior flagella and the wavy membrane. It also showed the shape of the pear if its anterior part was more comprehensive than its posterior part. This result was the same as that which was described (13).

Numerous clinical symptoms like ruffled feathers, lethargy, an unpleasant odor coming from the mouth, and difficulty eating were noted during the field examination of the pigeons in the various areas of Mosul, and these symptoms match what he discovered (14). However, despite these macroscopic clinical signs, the percentage of the negative Giemsa stain result was relatively high, equaling 69.7%. This could be because the parasite died. It appears that the severity of the macroscopic lesions varies on the strain's virulence, the bird's age, and the stage of infection, and it seems that not all songs are harmful to birds. When the birds feed their young, these distinctions between the

parasite and the severity of their virulence may go undetected, or they may manifest as simple pests or a lethal sickness that kills the birds within 7 to 21 days (15). One of the factors contributing to the spread of infection between infected and uninfected pigeons carrying the causative agent is the sharing of pigeons in one drinking water source assigned by a hobbyist or bird breeder, or the method of mating pigeons, according to what he found (16,17). This study noted that the highest positive percentage of the Giemsa stain was 30.3% (18).

Certain bird strains may be more prone to infection than others, as evidenced by the findings of one study, which suggests that *Trichomonas* infection was higher in wild pigeons than in domesticated pigeons (19). The existence of increased resilience that varies between species or that they don't live in precise and constrained locations, i.e., in an ambiguous habitat, could all be considered contributing factors. Since the trichomoniasis prevalence of pigeon less than one year was higher than that of adult birds, at a rate of 67.9% compared to 32.1% for pigeons older than a year, our research suggests that there is a high rate of infection in young ages pigeon less than a year. This may be due to the transmission of disease during the milking of the young birds and its low immunity.

Variations in geographic location, environmental conditions, age, or general resistance could bring these infection variations. The presence of the parasite in adult birds contributes to the parasite's continuation, race, survival, and continuing transmission.

The macroscopic examination revealed numerous alterations, including curdled material blocking the mouth and esophagus. Materials ranging from white to yellow have also been mentioned in another study (20).

The various histopathological alterations seen in the multiple organs revealed the presence of a comparable effect to that seen in one of the earlier studies (20), where that study found that there was severe inflammatory cell infiltration in the tissues of the trachea and larynx, as well as necrosis and inflammatory cell infiltration, primarily eosinophils, in the membrane of the esophageal mucosa. These findings were consistent with our earlier findings. With those of Abd El-Rahman *et al.* (21), Begum and others in Egypt (22), Bangladesh, Al-Sadi and Hamodi (23) in Mosul which observed desquamation in the proventriculus epithelial cells as well as necrosis of the sub-crop mucosa. A granuloma with giant cell development, hyperemia of the lung tissue, and a mild bronchial wall thickening due to glandular hyperplasia were all visible in the lung.

Conclusions

The study concluded that trichomoniasis was equally reasonably common in male and female homer pigeons in the Mosul city neighborhoods, Iraq, that some pigeons were infected despite the negative result, and that the infection

was more common in pigeons (less than one year) younger than mature birds (older than one year).

Acknowledgment

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دراسة مرضية لانتشار داء المشعرات في حمام زاجل السباق في مدينة الموصل، العراق

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الخلاصة

هدفت هذه الدراسة إلى إجراء دراسة مسحية لانتشار داء المشعرات في الحمام الزاجل في مدينة الموصل بالعراق وعلاقته بالجنس والعمر بناء على التغيرات المرضية. تم إجراء الفحص العياني لإجمالي ٢٥٦١ طائر (١٢٦٤ ذكور و ١٢٨٧ إناث) بأعمار ١٥٤٧ طائرا بعمر أقل من سنة و ١٠١٤ طائرا بعمر أكثر من سنة من شهر تشرين الأول ٢٠٢٢ إلى شهر كانون الثاني ٢٠٢٣. أظهرت النتائج عن إجمالي ٢٥٦١ طائرا. كان الحمام الزاجل السباق ١٨٥ (٧,٢٪) مع آفات إجمالية لداء المشعرات بمعدل ٥٦ طائرا موجبا لصيغة كيمزا (٣,٣٪) بواقع ٢٧ ذكرا (٤٨,٢٪) و ٢٩ إناثا (٥١,٨٪) و ٣٨ طائرا أقل من سنة واحدة (٦٧,٩٪) و ١٨ (٣٢,١٪) طائر أكثر من سنة. عيانيا كانت هناك أحجام متغيرة من الكتل النخرية والنقرحات الصفراء بجانب الفم والعين والغشاء المخاطي للفم والبلعوم والمريء. أظهرت التغيرات النسيجية المرضية في الغشاء المخاطي للفم والمريء والحوصلة والمعدة الحقيقية تجمع النسيج النخري وارتشاح الخلايا الالتهابية، بينما كانت في الكبد شديدة تمثلت ببؤر التهابية نخرية متعددة. استنتجت الدراسة إلى أن داء المشعرات كان منتشرا بشكل متساوٍ في ذكور وإناث حمام الزاجل في مناطق مدينة الموصل، العراق، ومن المحتمل إصابة بعض الحمام بالرغم من النتيجة السلبية، وأن العدوى كانت أكثر شيوعا في الحمام الأصغر من سنة مقارنة بالطيور البالغة الأكثر من سنة.