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Detection of the parasite *Plasmodium* Sp. in pigeons in Thi-qar Province

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Abstract
Avian malaria is a blood parasite that affects any bird species. It causes economic harm to the local avian and causes lethargy, anorexia and anemia in severe cases of parasitic infection. In the current research. 88 blood samples were collected in the pigeons in three different regions from (Thi-Qar Province) in January to the end of March 2024, which recorded to the total rate of (14.7%). The highest level of infection was recorded at the Souq Al- Shuyoukh and it was 25% with significant impact. highest infection rate of 25.80% in March and the lowest rate in January of *Plasmodium* sp. was recorded a significant influence.

Keywords: *Plasmodium* Sp., pigeons, in Thi-Qar province, avian malaria

Introduction
As one of the most common species of birds, the pigeon is considered to be the carrier of the cultural and aesthetic symbolism in the human society. There are many types, such as the ones used as meat or other purposes, which are common almost in every part of the world, with the exception of the polar areas. The birds live in the neighborhood with people and other animal species, they are kept as decorative elements, symbolized beings, sources of food, and research material [1, 2]. Plasmodium is a genus of the family Apicomplexa, which is a group of unicellular eukaryotes that are obligatory parasites.
The life cycles of the *Plasmodium* species involve development and growth inside a hematophagous insect as the host after which the parasites are injected into a vertebrate host during blood feeding. The main agent of avian malaria transmission is the mosquitoes. The phenomenon of climatic variables (temperature and humidity) can affect the activity of mosquitoes and biological development of the parasite. This directly has an effect on the transmission and spread of the parasite. When the temperature gets lower, the development of the mosquito is terminated, and the range of 21-28 degrees Celsius can be described as the optimal to keep the mosquito active and malaria to be spread [5, 6].
Avian malaria and related parasites have undergone a high degree of genetic and phenotypic diversity in their nature, which is manifested through different degrees of virulence, host range and distribution, so it serves as an excellent experimental model that is important in the ecological dynamics.

Materials and Methods
Sampling of blood
Pigeons were selected in three areas (Al-Rifai, Al-Shatrha, and Souq Al-Shuyoukh) total of 88 birds and collected between January and the end of March 2024. About 0.5 cc was taken of the axillary vein with a medical syringe after the removal feather and sterilization by alcohol (70%). Each was smeared over with a drop of blood on the edge of a glass slide which I spread with another glass slide and made into several thin smears. It was then dried using air and followed by the 3 minutes and treated with methyl alcohol 100%. It was then stained with 10% Giemsa solution and then left to dry and studied under a microscope with the help of a 100X oil immersion lens [9, 7].

Laboratory Techniques: After preparation of the glass slide of the blood smear, it was observed under a microscope with a (100X) lens in order to detect malaria parasite in pigeons as it was described by Bowman 2009, [9].

Statistical analyses

The statistical analyses were performed to determine the relationships with parasite occurrence through Chi-square test (2) of independence on the basis of which a P value of less than 0.05 was considered statistically significant [10].

Results and Discussion

The study revealed that *Plasmodium* sp in pigeon birds was detected by infection with different stages of the parasite (figure 1). The research showed that 13 among 88 blood samples were infected with different forms of the Plasmodium species parasite which a total of was 14.7%, infection rate. Our results agreed with sources [11, 12]. The rate of infection among pigeons was not high [1, 11, 13, 14]. Inadequate sampling and climatic conditions can be suggested as the reason behind the difference in infection rates and low level of infection observed in this study.

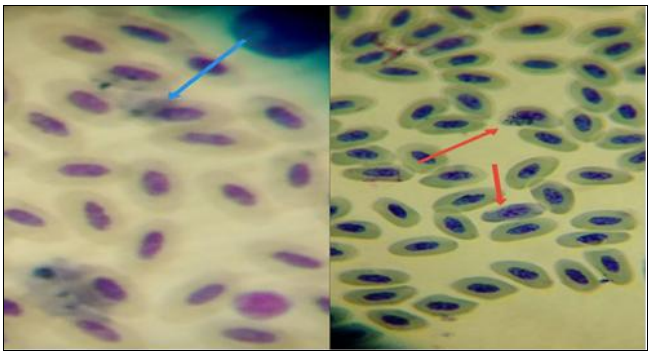

Fig 1: The various stages of the life cycle of the *Plasmodium* sp are observed on a thin smear of blood using Giemsa stain (X100).

Rates of plasmodium infection per months

From March through January was used to collect samples in order to determine the extent of the *Plasmodium* parasite spread in pigeons. The highest infection rate of 25.80% was recorded in March (Table 1). The high infection rate in march may be due to moderate humidity and temperature that allow the reproduction and activity of mosquitoes that are known to be the major hosts of the *plasmodium* Agree with [15, 16]. It was explained that infections appear in the months of moderate temperatures and the beginning of summer, which provides the best conditions to the proliferation and activity of mosquitoes, and infections are insignificant or absent in winter [17].

Table 1: Infection of *Plasmodium* According to Months

Months	No. Ex. samples	No. Inf. samples	%
January	30	1	3.33
February	27	4	14.81
March	31	8	25.80
Total	88	13	14.7

($P \leq 0.05$)

Rates of Plasmodium Infection by Study Regions

In the current study, there was a difference in the infection rates within the various regions as only 13 cases of *Plasmodium* sp were documented in three regions of Thi-Qar province with the highest rate of infection being 25% in the Souq-Alshuyouk region (Table 2). These findings were in agreement with those of Shathir, 2000, AL-Bayati, 2011 and Flayyih, 2014 [13, 15, 19]. This could be explained by the difference in the infection rates of pigeons with the *Plasmodium* parasite. The area with the greatest incidence rate was Suq Al- Shuyoukh, which is close to the marshlands, and also due to its climate, of medium temperature and humidity that are major contributors to the extent of activity and reproduction of the mosquito vector on which *Plasmodium* parasite is subjected to developmental stages.

Table 2: Infection of *Plasmodium* According to Regions

Regions	No. Ex. samples	No. Inf. samples	%
AL-Rifai	25	3	12
AL-Shatrah	31	2	6.45
Suk AL-Shuyoukh	32	8	25
Total	88	13	14.7

($P \leq 0.05$)

Conclusion

This study investigated malaria infected rates in pigeon in certain areas of Thi -Qar Province, in different rates across months and regions of the current a study. These results underscore the importance of implementing effective mosquito control measures using all available biological and chemical methods to eliminate mosquitoes and disrupt their life cycle. This is crucial for reducing malaria infection and protecting birds, especially domestic ones.

Conflict of Interest

Not available.

Financial Support

Not available.

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