

# Prevalence of Endoparasites and Ectoparasites in Pet Budgerigars (*Melopsittacus undulatus*) of Gujarat, India

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## ABSTRACT

Disease investigations in free-living and captive birds play crucial role in strategic planning for their conservation by generating database on existing prevalence and spread of diseases. Most of the native Indian birds are not allowed to be kept as pets due to the legal protection which has been provided to them under different legislations. This step has diverted bird-lovers to keep different types of exotic (*i.e.*, non-native) birds as in-house pets. Out of all exotic birds, Budgerigar (*Melopsittacus undulatus*) is one of the most common pet birds which are kept as in-house companions in urban as well as rural areas of India. These birds have close proximity to humans (keepers, zoo-keepers, sellers, owners and veterinary practitioners while handling); however, the details pertaining to existing status of diseases (e.g., infectious, non-infectious and zoonotic diseases) of Budgerigar population in India are sparse. Therefore, a study was undertaken to determine prevalence of endoparasites and ectoparasites in Budgerigars kept by owners and sellers at different places in Gujarat (India). *Ascaridia* spp., *Capillaria* spp., *Strongyle* spp., *Eimeria* spp. and Other *Coccidia* were identified as common endoparasites/protozoa while *Knemidocoptes* spp. (mite), *Sideroferus lunula* (feather mite) and *Heteromenopon* spp. (lice) were identified as common ectoparasites in screened population of Budgerigars. The prevalence rates varied among birds kept by owners and sellers which were correlated with various managerial aspects. The data generated through the study will provide information on existing endo- and ectoparasites of Budgerigars which will be beneficial to understand epidemiological aspects. Similar investigations involving wider geographic locations can be encouraged to generate strategies for disease prevention and treatment.

**Key words:** Budgerigar, Endoparasites, Ectoparasites, Prevalence

## Introduction

The trade of exotic mammals, reptiles and birds is on the rise throughout the world which can be due

to protection provided to different native species and intention/purpose of keeping exotic species (e.g., companionship, trade, exhibition, *ex-situ* conservation in captivity etc.). Trade of exotic species

involves international travel of live species from one country to another which should ideally go through a disease monitoring procedure in quarantine period after arrival at destination. Exotic species may harbor different infectious pathogens (bacteria, virus, fungus and parasites) which may possess threat to other native species and humans (*i.e.*, zoonosis). It is also important to screen exotic species which did not complete necessary quarantine period because of possible disease transmission to native species. Diseases of exotic species transmitted to native species can also cause devastating effects on on-going conservation efforts. Therefore, it is important to investigate health status of exotic species.

Out of all exotic species, exotic birds are commonly preferred by pet-lovers. Budgerigar (*Melopsittacus undulatus*) is the most common psittacine pet bird throughout the world. Wider availability (in terms of numbers and color variations), easy adaptation to indoor environment, mimicking abilities, lesser purchase cost, minimal husbandry and managerial practice (especially in permanent captivity) etc. are reasons behind the increasing popularity of Budgerigars as pets. Various attempts have been made by scientists to conduct disease investigation in Budgerigars which has resulted in generation of important data on many clinical conditions; however, these types of experimental or survey studies are yet to be carried out in different regions of India. Therefore, a study was undertaken to check prevalence of endoparasites and ectoparasites in Budgerigars in different areas of Gujarat, India. Detailed findings and their correlation with husbandry aspects have been described in the present paper.

## Materials and Methods

The present study was carried out at the Postgraduate Institute of Veterinary Education & Research (PGIVER), Kamdhenu University, Rajpur (Nava), Himmatnagar in collaboration with Polytechnic in Animal Husbandry (PAH), Kamdhenu University, Rajpur (Nava), Himmatnagar from September-2020 to March-2021. Cases of Budgerigars registered at Veterinary Hospital of PGIVER, Budgerigars kept by owners and Budgerigars kept by sellers were the 'Target population' of this study. A total of 173 Budgerigars (134 belonging to 13 owners + 39 belonging to 02 sellers at different places in Gujarat) were screened during the study to detect presence of en-

doparasites and ectoparasites. All the birds were subjected to detailed physical examination.

Faecal samples were collected from all the birds while feathers were observed to detect presence of ectoparasites. Non-probability and convenience sampling was preferred to assess actual field scenario of endo- and ectoparasites. Later, the faecal samples were processed to observe presence of egg/larvae/cyst of endoparasites or protozoa as per methods described by Soulsby (1982). Examination of faecal samples for endoparasite was performed under light microscope (Eclipse E100, Nikon). Ectoparasites (if any) were subjected to identification on morphological basis as per the descriptions given by Soulsby (1982), Schmaschke *et al.* (2001) and Valdebenito *et al.* (2015). Ectoparasites collected from birds or found on feathers were initially examined under stereo zoom microscope (SMZ800N, Nikon). Later, ectoparasites were examined under light microscope (Eclipse E100, Nikon) and permanent mounts were made as per methods described by Soulsby (1982). The prevalence (overall, birds kept by owners and birds kept by sellers) was recorded in is described as hereunder.

## Results

A total of 173 Budgerigars (134 belonging to 13 owners + 39 belonging to 02 sellers) were screened during the study to detect presence of endoparasites and ectoparasites. The overall prevalence, prevalence in birds kept by owners and prevalence in birds kept by sellers were recorded for endoparasites and ectoparasites as described hereunder.

### Overall Prevalence of Endoparasites in Budgerigars

Eggs of endoparasites such as *Ascaridia* spp., *Capillaria* spp., *Strongyle* type, *Eimeria* spp. and other *Coccidia* could be identified at different prevalence rates among screened population of Budgerigars. Overall presence of different endoparasites/protozoa, infestation by single endoparasite/protozoa, infestation by two different endoparasites/protozoa and infestation by three different endoparasites/protozoa were observed. Different endoparasites and protozoa found in faecal samples of Budgerigars are depicted in **Fig. 1**.

The overall presence of Other *Coccidia* was highest (71.10%; 123/173) followed by *Eimeria* spp. (60.12%; 104/173), *Ascaridia* spp. (06.94%; 12/173),

*Capillaria* spp. (04.62%; 08/173) and *Strongyle* spp. (02.31%; 04/173) in Budgerigars included in the present study.

Overall, single infestation by Other *Coccidia* was higher (10.40%; 18/173) as compared to *Eimeria* spp. (01.16%; 02/173). Single infestation by *Ascaridia* spp., *Capillaria* spp. and *Strongyle* spp. were not observed in study population of Budgerigars.

Overall, infestation by two different endoparasites/protozoa was highest for Other *Coccidia* + *Eimeria* spp. (49.13%; 85/173) followed by Other *Coccidia* + *Ascaridia* spp. (01.16; 02/172); Other *Coccidia* + *Capillaria* spp., Other *Coccidia* + *Strongyle* spp. and *Eimeria* spp. + *Strongyle* spp. (00.58%; 01/173, each).

Overall, infestation by three different endoparasites/protozoa was highest for Other *Coccidia* + *Eimeria* spp. + *Ascaridia* spp. (05.78%; 10/173) followed by Other *Coccidia* + *Eimeria* spp. + *Capillaria* spp. (02.31%; 04/173) and Other *Coccidia* + *Eimeria* spp. + *Strongyle* spp. (01.16%; 02/173).

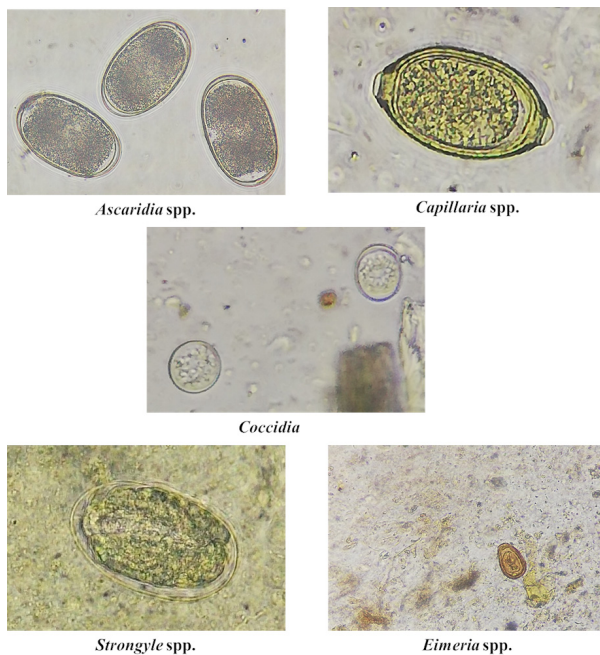


Fig. 1. Eggs of different endoparasites and protozoa found in faecal samples of Budgerigars

#### Prevalence of Endoparasites in Budgerigars kept by Owners

Out of 134 Budgerigars belonging to 13 different owners from different regions, the overall presence of Other *Coccidia* was highest (63.43%; 85/134) followed by *Eimeria* spp. (52.99%; 71/134); *Ascaridia*

spp. and *Capillaria* spp. (05.97%; 08/134, each) and *Strongyle* spp. (02.99%; 04/134) in faecal samples.

Single infestation by Other *Coccidia* was higher (09.70%; 13/134) as compared to *Eimeria* spp. (01.49%; 02/134). Single infestation by *Ascaridia* spp., *Capillaria* spp. and *Strongyle* spp. were not reported in Budgerigars kept by owners.

Infestation by two different endoparasites/protozoa was highest for Other *Coccidia* + *Eimeria* spp. (41.79%; 56/134) followed by Other *Coccidia* + *Ascaridia* spp. (01.49%; 02/134); Other *Coccidia* + *Capillaria* spp., Other *Coccidia* + *Strongyle* spp. and *Eimeria* spp. + *Strongyle* spp. (00.75%; 01/134, each).

Infestation by three different endoparasites/protozoa was highest for Other *Coccidia* + *Eimeria* spp. + *Ascaridia* spp. (04.48%; 06/134) followed by Other *Coccidia* + *Eimeria* spp. + *Capillaria* spp. (02.99%; 04/134) and Other *Coccidia* + *Eimeria* spp. + *Strongyle* spp. (01.49%; 02/134).

#### Prevalence of Endoparasites in Budgerigars kept by Sellers

Out of 39 Budgerigars belonging to 02 different owners from different regions, the overall presence of Other *Coccidia* was highest (97.44%; 38/39) followed by *Eimeria* spp. (84.62%; 33/39) and *Ascaridia* spp. (10.26%; 04/39) in faecal samples. *Capillaria* spp. and *Strongyle* spp. were not observed in faecal samples of Budgerigars kept by sellers.

Single infestation of endoparasites/protozoa was only evident for Other *Coccidia* in 12.82% (05/39) birds. Infestation by two different endoparasites/protozoa was evident for Other *Coccidia* + *Eimeria* spp. in 74.36% (29/39) birds while infestation by three different endoparasites/protozoa was evident only for Other *Coccidia* + *Eimeria* spp. + *Ascaridia* spp. (10.26%; 04/39) in Budgerigars kept by sellers.

#### Overall Prevalence of Ectoparasites in Budgerigars

In the present study, two different mites including one scaly face mite (*Knemidocoptes* spp.) and one feather mite (*Sideroferus lunula*) as well as one type of lice (*Heteromenopon* spp.) were identified in Budgerigars. Microscopic appearance of *Knemidocoptes* spp. mite found in Budgerigars is shown in Fig. 2. The presence of *Sideroferus lunula* feather mites on feathers and microscopic appearance is shown in Fig. 3.

Out of 173 Budgerigars included in the study, the overall prevalence of ectoparasitic infestation was 24.86% (43/173). Overall prevalence of *Knemidocoptes* spp. mite, *Sideroferus lunula* feather



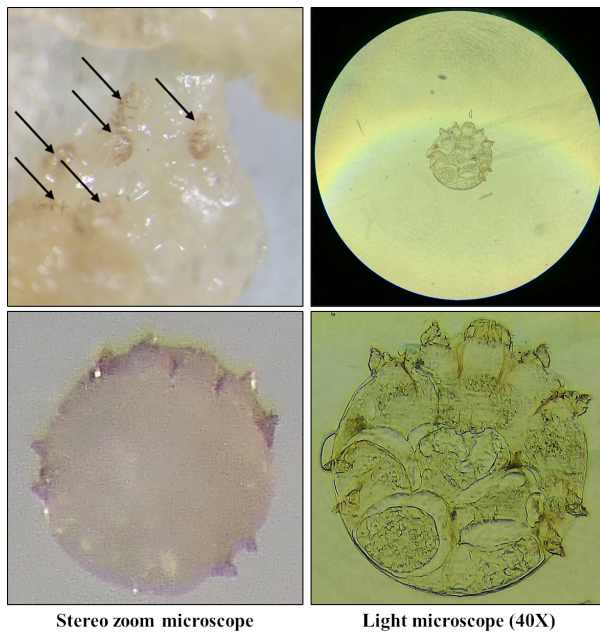


Fig. 2. Microscopic appearance of *Knemidocoptes* spp. identified in Budgerigars

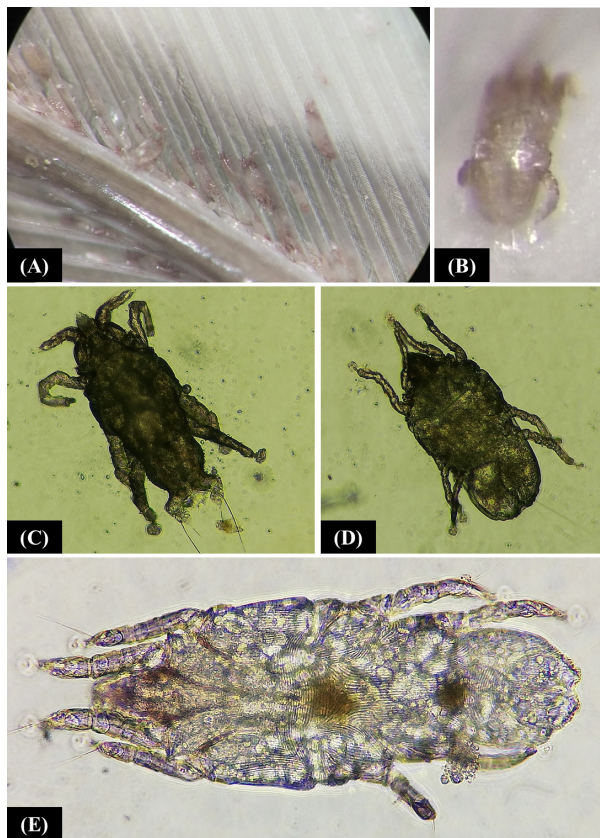


Fig. 3. Presence of feather mites on feathers (A & B) and microscopic appearance (C, D & E; 40X)

mites and *Heteromenopon* spp. lice were 13.29% (23/173), 07.51% (13/173) and 04.05% (07/173), respectively.

#### Prevalence of Ectoparasites in Budgerigars kept by Owners

Out of 134 Budgerigars belonging to 13 different owners from different regions, the overall prevalence of ectoparasitic infestation was 26.11% (35/134). The prevalence of *Knemidocoptes* spp. mite and *Sideroferus lunula* feather mites were 16.41% (22/134) and 09.70% (13/134), respectively. None of the Budgerigars kept by owners were found to have lice infestation.

#### Prevalence of Ectoparasites in Budgerigars kept by Sellers

Out of 39 Budgerigars belonging to 02 different owners from different regions, the overall prevalence of ectoparasitic infestation was 20.51% (08/39). The prevalence of *Knemidocoptes* spp. mite and *Heteromenopon* spp. lice were 02.56% (01/39) and 17.95% (07/39), respectively.

#### Discussion

In the present study, *Eimeria* spp., Other *Coccidia*, *Ascaridia* spp., *Capillaria* spp. and *Strongyle* spp. were found in faecal samples of Budgerigars kept by owners and sellers in Gujarat. In past, various scientists documented presence of different endoparasites and protozoa in Budgerigars at different places. Presence of *Coccidia* was also described by Papini *et al.* (2012). Presence of *Eimeria* spp. was described by Parsani *et al.* (2001), Sahoo *et al.* (2010), Prathipa *et al.* (2013) and Hasan *et al.* (2018). *Ascaridia* spp. infestation in Budgerigars was documented by Doneley (2009), Sahoo *et al.* (2010), Gonzalez-Hein *et al.* (2012), Prathipa *et al.* (2013), Hasan *et al.* (2018) and Joseph *et al.* (2020). Observations on presence of *Strongyle* spp. in faecal samples of Budgerigars is in correlation with report of Prathipa *et al.* (2013). Presence of *Capillaria* spp. in faecal samples of Budgerigars is in correlation with findings of Benardi *et al.* (2013), Prathipa *et al.* (2013), Moudgil (2015) and Joseph *et al.* (2020). Infestation by *Capillaria* spp. and *Ascaridia* spp. in psittacine birds has also been described by Valdebenito *et al.* (2015).

Here, the presence of endoparasites and protozoa in faecal samples of Budgerigars strongly indicates that deworming practices and protocols might not

be followed by owners and sellers on regular basis. Therefore, the baseline data of this prevalence will lay a strong platform to develop strategic plans to curb the menace of endoparasitosis in Budgerigars. Moreover, the endoparasites and protozoa found in faecal samples of Budgerigars included in the study have also been documented by various scientists throughout the world. This indicates that international travel or trade of Budgerigars must be monitored. Additionally, variation in prevalence and varieties of endoparasites in Budgerigars may also depend on geographic distribution, knowledge level of owners/sellers on healthcare of Budgerigars, irregularities in deworming, adoption of hygienic practices (e.g., cleaning of cages, cleaning of enrichment materials etc.), general managerial practices (e.g., frequency of cleaning, keeping different species of birds in single cage, exposure to grounds etc.) etc. Owners and sellers of Budgerigars may not use protective gloves or masks while cleaning the cages or handling the birds. This may also increase chance of parasitic zoonosis. Therefore, the findings of the study will be useful for veterinary practitioners and scientific community to generate target-specific deworming protocols and disease prevention guidelines for Budgerigars as well as owners in field.

With regards to ectoparasites, the *Knemidocoptes* spp. was reported as the only mite which caused clinical lesions on beak, legs, face and cere of Budgerigars examined in the present study. Overall prevalence of *Knemidocoptes* spp. mite in the present study [13.29%] was very similar with the prevalence reported by Abou-Alsoud and Karrouf (2016) [11.5%]. Extensive investigations on exact prevalence of *Knemidocoptes* spp. in Budgerigars owned by owners or kept by sellers has not been known in all regions. The presence of *Knemidocoptes* spp. mite in Budgerigars in India and other countries has also been documented by Kirmse (1966); Toparlak *et al.* (1999); Beck (2000), Doneley (2009); Hossain *et al.* (2012); Elbal *et al.* (2014); Samal *et al.* (2014), Abou-Alsoud and Karrouf (2016); Jameel (2016), Akhtar *et al.* (2018); Palanivelrajan *et al.* (2020) and Bhadesiya *et al.* (2021).

*Sideroferus lunula* was identified as the only feather mite causing clinical infestation in Budgerigars examined during the study. This mite was mostly present on both the sides of feather shaft in birds. Literature could not be found on clinical infestation of *Sideroferus lunula* in Budgerigars kept by owners and sellers in Gujarat or India. However;

clear evidence of *Sideroferus lunula* infestation in Budgerigars has been documented by Schmaschke *et al.* (2001), Benardi *et al.* (2013) and Kocon and Nowak-Chmura (2017). Besides *Sideroferus lunula*, other feather mites such as *Dubininia melopsittaci* has been documented by Atyeo and Guad (1987), Schmaschke *et al.* (2001) and Kocon and Nowak-Chmura (2017) in Budgerigars.

The feather mite infestation in Budgerigars and their association with transmission of zoonotic diseases or skin infections has not been documented; however, Schmaschke *et al.* (2001) stated that feather mites may act as allergens to keepers. This aspect justifies a need to investigate a larger population of Budgerigars to ascertain prevalence of different feather mites and their correlation with skin allergies in owners or keepers. Thus, the baseline prevalence of feather mite infestation reported through this study will benefit veterinary practitioners, public health experts, human dermatologists and the entire scientific community to conduct a target-specific survey and generate preventive guidelines against skin allergies caused by feather mites of Budgerigars.

The *Heteromenopon* spp. of lice was the third ectoparasite found in Budgerigars included in the study. Budgerigars are psittacine birds and observation on clinical presence of *Heteromenopon* spp. lice in the present study is in correlation with observations of Valdebenito *et al.* (2015) in psittacine birds.

Literature pertaining to existing prevalence of lice infestation by *Heteromenopon* spp. in Budgerigars kept by owners and sellers in Gujarat and India could not be accessed during the study period. Besides *Heteromenopon* spp., active clinical infestation by *Neopsittacus gracilis* lice has been documented by Kocon and Nowak-Chmura (2017) while clinical infestation by *Afrimenopon waar* has been documented by Sychra *et al.* (2007) and Dik *et al.* (2013) in countries other than India.

Here, a total of 173 Budgerigars were screened to detect ectoparasitic infestation. Ectoparasites such as ticks, lice, fleas, flies and mites are known to cause various types of vector-borne diseases in animals, birds and humans. The findings of the study will provide a baseline data on existing prevalence of ectoparasitic infestation in Budgerigars which will help veterinary practitioners and academicians to identify potential health impacts of ectoparasites in host birds, other birds as well as humans (e.g., keepers, owners, sellers) which are directly or indirectly

handling these birds.

## Conclusion

The highest overall prevalence of endoparasites/ protozoa was reported for Other *Coccidia* followed by *Eimeria* spp., *Ascaridia* spp., *Capillaria* spp. and *Strongyle* spp. in Budgerigars screened during the study period which suggest that Budgerigars should be screened for endoparasitic infestation and should be dewormed with specific anthelmintics/ dewormer on regular basis. Among ectoparasites, the overall prevalence of *Knemidocoptes* spp. of mite was higher followed by *Sideroferus lunula* feather mites and *Heteromenopon* spp. lice. Budgerigars with ectoparasitic infestation may lead to possibilities of vector-borne diseases and may affect market value of birds. Therefore, sellers and owners may be advised to seek expert veterinary services for newly arrived Budgerigars so that necessary therapeutic and preventive strategies can be implemented in time. Similar investigations involving wider geographic locations should be encouraged to generate database on existing endoparasites and ectoparasites of Budgerigars.

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