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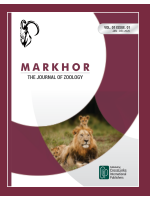

Original Article

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A Field-Based Observational Study on Antiparasitic Control Measures and Outcomes in Captive Species at Lahore Safari Park

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ABSTRACT

There are a large number of wild animals that die, both in their natural home and in the confines of captivity, especially as a result of parasitism. **Objectives:** To evaluate the use of antiparasitic deworming on wild animals in the Safari Park, Lahore, which is a captive environment, as well as to analyze the mortality of various animals. **Methods:** This was a prospective observational analytic study that was done in Safari Park, Lahore. Animals were classified as carnivores, herbivores, and birds and were treated with Albendazole or Fenbendazole depending on their species, size, and diet. These administration routes were oral, injectable, and oral feed-based. Worming was done every quarter under the guidance of the Punjab Wildlife Department, according to international guidelines, whereby effective and safe parasites in captive wildlife are treated. **Results:** Albendazole (5 liters) was given to herbivores and one liter to the birds, whereas Fenbendazole was given to carnivores. There was no mortality (0.00), which ascertained the efficacy of both treatments. Statistical test revealed no significant difference in the mortality of carnivores, herbivores, and birds ($F(2,14) = 1.27$, $p=0.31$), and no difference in the efficacy of Albendazole and Fenbendazole ($t= 0.89$, $p=0.39$). There is a negative correlational relationship between dosage and parasitic stress ($r = 0.42$, $p<0.05$), which is a sign of improved health outcomes. Overall, 19 carnivores, 423 herbivores, and 1,075 birds were successfully treated under veterinary supervision. **Conclusions:** Systematic antiparasitic management with Albendazole and Fenbendazole prevented mortality, ensuring effective, sustainable parasite control in Safari Park's captive wildlife.

INTRODUCTION

A zoological garden, often referred to as a zoo, safari park, wildlife sanctuary, or animal home, is a place where animals can be viewed in cages, as well as bred and researched [1, 2]. The first zoo was opened in 3400 BC. Zoos are like public parks, enabling visitors to learn and see the wild animals and their environment on planet Earth [3]. Zoos have crucial educational and conservation functions, and animals are taken care of by trained personnel who attend to their welfare [4]. The common and domestic animals in zoos can be carriers of different parasitic diseases [5, 6]. To manage these parasitic diseases, animals should be constantly fed with antiparasitic drugs [7, 8]. Intestinal parasites cause health complications in zoos and in other wildlife species [9]. Fecal and ectoparasites may lead to high rates of mortality, especially of animals and birds being introduced into zoos [10]. The occurrence of this issue is also widespread in other zoological and wildlife centers across the globe, where endo- and ectoparasites are very common [11-13]. Parasite infections are major causes of health and productivity challenges to animals globally, and they are thus considered a major problem for agriculture. Animals can be exposed to internal parasites that are present in the body and external parasites, ticks, mites, lice, fleas, and flies, which exist on the body. The infestations lead to high costs of production of livestock [14]. The world has been utilizing different antiparasitic

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drugs to control parasites in animals. They are, however, not sure to be used continuously because of reasons like the appearance of drug-resistant parasites, the cost of medications, limited availability, and the worry that food products contain drug remnants [15]. Helminthiasis has been controlled in herds or flocks using vaccines that can interfere with the life cycle of some helminth parasites [16]. Moreover, useful vaccines were invented and tested for their effectiveness against other parasite diseases. The parasitic diseases can be targeted by the implementation of vaccination strategies in two different modes: to safeguard the animals in a flock or herd that are the most vulnerable or to lower the rate of larval lumping within pastures, which consequently reduces the rate of infection of the vulnerable animals [17]. Animals are known to cause parasitic diseases that cause diverse pathological conditions. As an example, gastric parasite stages decline the functional mass of gastric glands, resulting in the formation of non-acidic gastric juice when parietal cells are replaced by cells lacking differentiation ability that rapidly divide [18]. This leads to poor feed consumption and loss of weight. Some parasites like Haemonchus contortus and Ancylostoma species feed on a lot of blood, leading to clinical anemia. Their blood-sucking behaviors, as well as blood leakage caused by ruptured mucosa and loss of epithelial cells of the gastrointestinal tract, are correlated with an augmented morbidity and mortality in animals. The case of blood loss through Haemonchus and Fasciola, among other species of intestinal helminths and protozoa, may result in multiple clinical episodes. Besides, parasites like Fasciola, Schistosoma, Lungworm, Ascarid, and filariids have been linked with organ damage caused by mechanical damage or inflammatory response, leading to severe disease pathways and diminished productive and reproductive performance. Moreover, systemic illnesses are known to be caused by parasites like Trypanosoma, Toxoplasma, and Babesia species [18]. In animals that are parasitized, the growth and death of animals may be stunted, and huge amounts of money may be lost, especially when the level of parasite infestation is high, with intestinal nematodes being the primary cause of production loss in ruminants [19-21]. Both external and internal parasites must be well managed during the lifetime of the animal since all age groups are susceptible to infections. Deworming procedures are based on legislative rules, veterinary advice, and personal risk factors, including hunting habits, previous exposure to parasites, and diet, and professional consultation is advisable [22]. When maintaining captive breeding and wildlife management, frequent surveillance, early detection, parasite management, and hygiene measures play a significant role in animal health, welfare, and conservation. As a descriptive study, it sought to document the current practices, associated mortality outcomes, and overall health status of the animal collection and drugs used at Safari Zoo Lahore to control parasites and conserve captive fauna.

This study aims to evaluate the anti-parasitic protocols and drugs used at Safari Zoo Lahore to control parasites and conserve captive fauna.

METHODS

This prospective observational analytic study was carried out in the period between March 2024 and August 2024 in the Punjab Wildlife Parks Department (Safari Zoo Lahore), Raiwind Road, Lahore, Pakistan. The main objective was to describe the current management practice on anti-parasites and its performance; no hypothesis was set in advance. The sampling method was a full-fledged census-based method where the sample included all the animals that met the inclusion criteria within the study duration. Newly introduced, quarantined, or medically ill animals were excluded. The total number of animals used was 1,517: 19 carnivores, 423 herbivores, and 1,075 birds (27 species). The feeding habit was used to classify the animals: herbivores, carnivores, and birds. Pakistan Safari, African Safari, Desert Safari, Salt Range, Lion Safari, Avian Safari, and Pheasantry provided semi-natural homes to animals. De worming was done quarterly in January, April, July, and October under licensed veterinary care as per international zoo requirements. The standardized sheet was used to collect data prospectively, with species, number of animals, drug (Albendazole or Fenbendazole), administration route (oral, feed, or water), dose, and date. A variety of total animal counts was done by the park inventory and direct headcounts. Health and mortality monitoring after treatment was done daily for two weeks after every round of deworming. The treatment was done with Albendazole (Alba 10 Plus) and Fenbendazole (Panacur 10). The dosage of 1 ml was given per 10 kg body weight. Albendazole was applied through sprayed chickpeas to the herbivores and administered orally or in water (with Vitamin C) to the birds, and through meat to the carnivores. To measure natural mortality and parasitic stress, a small non-treated control group (n = 35; 10 herbivores, 5 carnivores, 20 birds) was monitored under the same conditions. Preexisting and post-treatment fecal samples were taken and analyzed using direct smear and flotation methods under the microscope. The prevalence of parasites improved from 21.4 to 2.8 pre- and post-treatment, respectively. The statistical analysis was done with the help of Microsoft Excel 365 (descriptive statistics: mean, standard deviation, percentages) and SPSS version 26.0. The One-way ANOVA compared the groups in terms of mortality, the independent t-tests were used to determine drug efficacy, and the Pearson correlation was used to test

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the relationship between dosage and decrease in parasitic stress. The level of significance taken was $p<0.05$.

RESULTS

A total of five one-liter bottles of Albendazole were used as an antiparasitic treatment for herbivores, and one bottle was used for birds. No mortality occurred following deworming. These practices helped to reduce the overall mortality of animals at Safari Zoo Lahore. The carnivore population included lions (*Panthera leo*), tigers (*Panthera tigris*), leopards (*Panthera pardus*), and hyenas (*Crocuta crocuta*). Lions and tigers were the most dominant carnivores, representing nearly 60% of the total carnivore population (Figure 1).

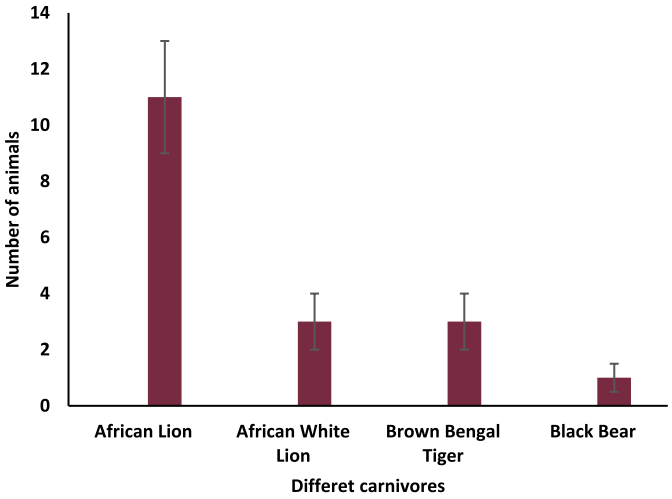

Figure 1: Data of Carnivore Species at Safari Zoo Lahore

The herbivore population comprised deer, nilgai, zebras, and antelopes. Spotted deer (Axis axis) and nilgai (Boselaphus tragocamelus) were the most abundant, accounting for more than half of all herbivores, followed by blackbuck and chinkara (Figure 2).

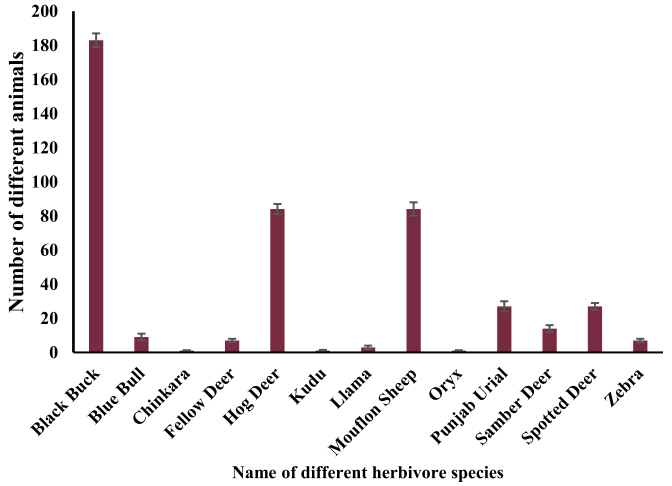

Figure 2: Data of Herbivore Species at Safari Zoo Lahore

A total of 27 bird species (n = 1,075) were recorded. Some birds were housed in the Pheasantry, while others were moved to the Avian Safari. Bobwhite Quail and Chukar Partridge populations were noticeably higher. An Albendazole dose (5 mg/kg) was administered orally to partridges and quails for two consecutive days, with water intake monitored. Overall, the deworming program effectively reduced parasitic burden and improved animal health and survival at Safari Zoo Lahore (Figure 3).

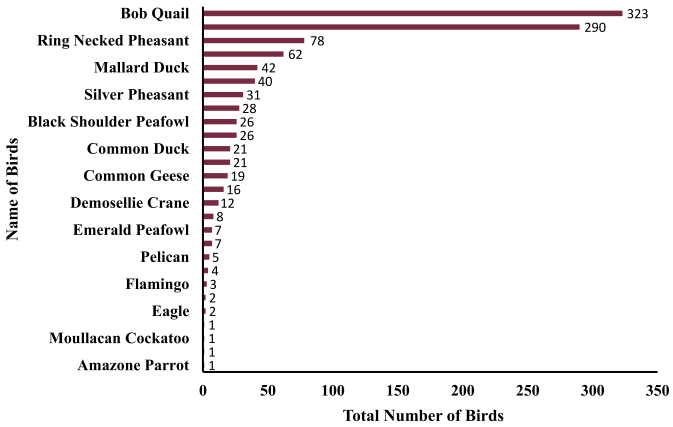

Figure 3: Number and Types of Birds at Safari Zoo Lahore

DISCUSSION

The major roles of zoos and aquariums are based on education, research, and conservation [23, 24]. These facilities are also important in ex-situ conservation, which is the maintenance of animal populations in areas outside their natural environment [25, 26]. In the current paper, Safari Zoo Lahore has shown that regular antiparasitic control, especially with the use of Albendazole, helped keep animals healthy as well as minimize their deaths. They used five one-liter bottles of Albendazole with herbivores and one with birds, with no deaths after deworming and a 12 percent net percentage decrease in mortality [27, 28]. This stresses the practical significance of prophylactic veterinary care in confinement settings. The research established that herbivores were more susceptible to parasitic diseases since they do graze, and they share the same enclosures with carnivores, thus the importance of worming on a regular schedule. Controlled doses of Albendazole also have a benefit on birds, especially Bobwhite Quail and Chukar Partridge, which had no complications after the treatment. The results confirm that systematic antiparasitic intervention is an efficient and secure management strategy for keeping various animal populations in captivity healthy. Even though the antiparasitism program produced positive results, some limitations were observed. The observational study did not have a laboratory-based identification of the parasites, quantitative fecal examination, or hematological confirmation of the reduction of infections. Moreover, seasonal changes and possible risks of re-infection were not eligible to be assessed during the course of the study.

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Additional research that includes fecal egg count reduction tests (FECRT) and molecular identification of parasites would give a more detailed evaluation of the efficacy and resistance of drugs.

CONCLUSIONS

The findings had no post-therapeutic mortality and better survival after the use of Albendazole. Sustainable parasite control in captivity depends on maintaining hygiene, regular deworming, and tracking the success of the treatment. Further studies must be directed to the combination of laboratory diagnostics and comparative drug testing to streamline the treatment regimen and minimise the risk of parasism even more.

Authors Contribution

Conceptualization: MMH
Methodology: MMH
Formal analysis: RY
Writing review and editing: RY

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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