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Original Article

Prevalence, Risk Factors, and Parasitological Examinations of *Trypanosoma Evansi* in Camels in Bhakar, Pakistan

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ABSTRACT

Objectives: This study conducted in Bhakar, assessed prevalence, risk factors, and parasitological examinations of *Trypanosoma evansi* in camels. **Methods:** A total of 140 camels were integrated in this study from District Bhakar during 2022-23. **Results:** Among them, 8 camels tested positive for *T. evansi*, resulting in a prevalence rate of 5.71%. This relatively low prevalence indicated that the infection is not widespread among camels in the Bhakar district. The analysis of risk factors revealed no significant alterations in the infection rates between male and female camels. Both male and female camels exhibited similar prevalence rates, with 4.34% and 5.98% respectively. This suggested that *T. evansi* infection does not exhibit a sex bias in this population of camels. Regarding the potential risk factors examined in this study, including vector control measures, veterinary care, management practices, and awareness pertaining to the disease, no statistically significant associations were found with *T. evansi* infection. Although some weak associations were observed, such as insufficient vector control measures, inadequate veterinary care, poor management practices, and lack of awareness, these associations did not reach statistical significance. **Conclusion:** The findings of this study provided valuable insights into the prevalence and risk factors associated with *T. evansi* in camels in Bhakar. The relatively low prevalence suggested that the current control measures and management practices implemented in the area may have some effectiveness in preventing and controlling *T. evansi* infection. However, it is crucial to continue monitoring and surveillance efforts to detect any changes in prevalence and risk factors that may require adjustments in control strategies.

INTRODUCTION

Trypanosoma evansi, a hemoprotozoan parasite, is responsible for causing Surra or camel trypanosomiasis, a significant infectious disease affecting camels worldwide [1]. Camels amuse the crucial role in the livelihoods and economies of many countries, including Pakistan, where they are integral to the agricultural and transportation sectors [2]. Bhakar, a district in Pakistan, has a substantial camel population, making it an important area to study the prevalence, risk factors, and parasitological examinations of *T. evansi* [3-4].

Prevalence of *T. evansi* in camels has severe implications for both animal health and productivity. The parasite causes various clinical signs, including weight loss, anemia, weakness, and reduced milk production [5]. In severe cases, it can lead to mortality of infected camels. Moreover, presence of *T. evansi* in camels also poses a zoonotic risk, as humans can be infected through bite of infected tsetse flies or direct contact with infected animals [6].

Identifying the risk factors associated with prevalence of *T. evansi* is crucial for developing effective control and prevention strategies [7-8]. Several factors contribute to the spread and maintenance of the parasite, including the presence of suitable vectors, inadequate veterinary care, improper management practices, and lack of awareness among camel owners regarding disease [9]. Understanding these risk factors will assist in designing targeted interventions and raising awareness among camel herders and owners [10].

Parasitological examinations serve as a critical tool in diagnosing *T. evansi* infections. Techniques such as microscopic analysis, hematological analysis, and serological assays bear the significant role in detecting the presence of the parasite, assessing the severity of infection, and monitoring the effectiveness of treatment and control measures [11-12]. These examinations not only aid in the early detection of infected animals but also provide valuable information for surveillance and epidemiological studies [13].

In this study, *T. evansi* existence among camels in Bhakar, Pakistan was instigated. We explored the associated risk factors, including management practices, vector presence, and veterinary care. Additionally, we conducted parasitological examinations to accurately diagnose and quantify the parasite's presence in the camel population. The findings of this study contributed to the existing knowledge on *T. evansi* in camels and provide insights for the development of targeted control and prevention strategies in Bhakar, Pakistan. Overall, understanding the prevalence, risk factors, and parasitological examinations of *T. evansi* in camels is essential for safeguarding the health and productivity of these animals and minimizing the zoonotic risk to humans.

MATERIAL AND METHODS

Study Area

The study was conducted in Bhakar, the district located in the province of Punjab, Pakistan. Bhakar has a significant population of camels, making it an ideal area to investigate the prevalence, risk factors, and parasitological examinations of *T. evansi*.

Sample Collection

A cross-sectional study design was employed to collect samples from camels in different locations across Bhakar district. A total of 140 camels were randomly selected from different herds [14]. Blood samples were collected aseptically from each selected camel using sterile vacutainer tubes. Samples were appropriately labeled and transported to the laboratory for further analysis.

Parasitological Examinations

Microscopic examination of blood smears was performed to detect *T. evansi*. Thin and thick blood smears were prepared from each blood sample and stained with Giemsa stain. Smears were observed under a light microscope, and the presence of *T. evansi* parasites was recorded [15].

Risk Factor Assessment

Structured questionnaires were administered to the camel owners or herders to gather information on potential risk factors associated with *T. evansi*. The questionnaire included variables such as management practices, vector control measures, veterinary care, and awareness about camel trypanosomiasis. The collected data were analyzed to identify significant risk factors contributing to its prevalenc.

Data Analysis

The collected data were entered into a database and analyzed using appropriate statistical software. Chi-square or ANOVA test was employed to assess the association between potential risk factors and the presence of the parasite. A p-value of <0.05 was considered statistically significant.

Ethical Considerations

Informed consent was obtained from the camel owners or herders before sample collection. All procedures were conducted following ethical guidelines to ensure the welfare of the animals involved in the study.

Limitations

Firstly, the cross-sectional design provides a snapshot of the prevalence and risk factors but may not capture the dynamics of *T. evansi* infection over time. Secondly, the study was limited to a specific geographic area (Bhakar district) and may not represent the situation in other regions of Pakistan. Nonetheless, the findings of this study can still provide valuable insights for camel health management and control strategies in Bhakar and similar camel-rearing areas.

RESULTS

The results of the survey conducted were expressed in the tabulated form, which included a sample size of 140 camels. Among these camels, 8 tested positive for *T. evansi*, diagnosed through microscopic examination of Giemsa stained smears (Figure 1), while the remaining 132 tested negative. The prevalence was calculated by dividing the number of positive cases by the total sample size and multiplying by 100, resulting in a prevalence rate of 5.71%. This information suggested that out of the 140 camels' samples, approximately 5.71% tested positive for trypanosomiasis (Table 1).

Results of study on prevalence of *T. evansi* in camels in District Bhakar, focused on differences between male and female camels. A total of 140 camel samples were collected for analysis. Out of 23 male camels included in the study, only one tested positive for *T. evansi*, while the remaining 22 tested negative. This yieled a prevalence rate of 4.34% for *T. evansi* in male camels. In contrast, out of 117 female camels tested, seven were tested positive for *T. evansi*, while the remaining 110 tested negative. This gave the prevalence rate of 5.98% for *T. evansi* in female camels ($p>0.05$). The chi-square value of 0.086 indicated a weak association between sex and *T. evansi* infection. Furthermore, the p-value of 0.7693 suggested that this association was not statistically significant. Overall, the findings from this study indicated that prevalence of *T. evansi* in male and female camels in District Bhakar was relatively low, with no significant difference between the sexes (Table 2).

We examined the number of infected camels and non-infected camels for each risk factor, along with the statistical analysis. Regarding vector control measures, out of the 8 infected camels included in the study, 2 were found to be associated with a lack of effective vector control measures. Among the 132 non-infected camels, 76 were also linked to insufficient vector control measures. The chi-square value for this association was calculated as 1.1358, indicating a weak association. Furthermore, the p-value associated with this association was 0.2865, suggesting that it was not statistically significant ($p>0.05$). In terms of veterinary care, 3 infected camels were associated with inadequate veterinary care, while 34 non-infected camels were also linked to suboptimal veterinary care ($p>0.05$). Regarding management practices, 2 infected camels were associated with poor management practices, while 77 non-infected camels were also linked to similar management practices. The chi-square value for this association was calculated as 1.1739, indicating a weak association. The p-value associated with this association was 0.2786, suggesting that it was not statistically significant ($p>0.05$). Lastly, in terms of awareness about the disease, 2 infected camels were associated with a lack of awareness, while 27 non-infected camels were also linked to insufficient awareness ($p>0.05$). The p-value associated with this association was 0.8059, suggesting that it was not statistically significant (Table 3).

Figure 1: Microscopic illustration of *T. evansi* in Giemsa stained smear

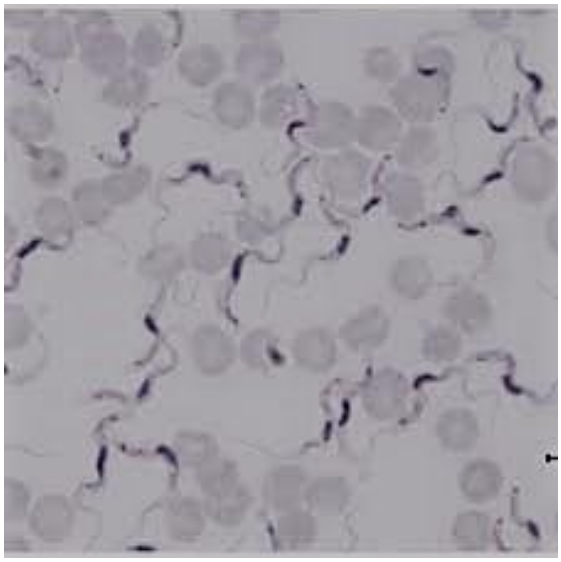

Table 1: Overall prevalence of *T. evansi* in camels in District Bhakar

S. No	Sample size	No. of positive cases (n)	No. of negative cases (n)	Prevalence (%)
1	140	08	132	5.71

Table 2: Sex-wise prevalence of *T. evansi* in camels in District Bhakar

Sex	Samples collected (n=140)	No. of positive cases (n)	No. of negative cases (n)	Prevalence (%)
Male	23	01	22	4.34
Female	117	07	110	5.98
Chi-square value	0.086			
p-value	0.7693 (Non-significant)			

Table 3: Association between the risk factors and *T. evansi* in camels

Risk factors	No. of infected camels (n=08)	No. of non-infected camels (n=132)	Chi-square value	p-value
Vector control measures	02	76	1.1358	0.2865
Veterinary care	03	34	0.2877	0.5916
Management practices	02	77	1.1739	0.2786
Awareness about the disease	02	27	0.0603	0.8059

DISCUSSION

Survey aimed to investigate prevalence, risk factors, and parasitological examinations of *T. evansi* in camels in Bhakar, Pakistan. The results showed an overall prevalence rate of 5.71% for *T. evansi* in sampled camels. This finding indicated that *T. evansi* was present in the camel population in Bhakar, albeit at a relatively low prevalence [4].

The prevalence rate observed in this study was consistent with some previous reports on camel trypanosomiasis in Pakistan, such as study reporting a similar prevalence rate of 6.2% in camels in Pakistan. However, it is worth noting that the prevalence rates could vary across different regions and even within the same region due to various factors, including differences in management practices, vector control measures, and environmental conditions [16].

In the analysis of risk factors associated with *T. evansi* infection, no significant association was found between the sex of camels and the presence of the parasite. Both male and female camels showed similar prevalence rates, indicating that *T. evansi* infection did not exhibit a sex bias in this population. These findings were consistent with previous studies conducted suggesting that sex did not play a significant role in its susceptibility to infection [17-18].

Regarding the potential risk factors examined in this study, including vector control measures, veterinary care, management practices, and awareness about the disease, none of them showed a statistically significant association with *T. evansi* infection. Although weak associations were observed between some risk factors and the presence of the parasite, these associations did not reach statistical significance. It is important to note that lack of statistically significant associations may have been due to various factors, such as the limited sample size or the complexity of the disease transmission dynamics [19].

The limitations of this study should be considered when interpreting the results. Firstly, the cross-sectional study design employed provided a snapshot of the prevalence and risk factors at a specific point in time and may not have captured the temporal dynamics of *T. evansi* infection. Longitudinal studies would provide more insights into the changes in prevalence and risk factors over time. Secondly, the study was conducted in a specific geographic area (Bhakar district) and may not have fully represented the situation in other regions of Pakistan [20]. Therefore, caution should be exercised when generalizing the findings to other camel-rearing areas.

Despite these limitations, findings of this study contributed valuable information to the understanding of *T. evansi* infection in camels in Bhakar, Pakistan. The relatively low prevalence suggested that the current control measures and management practices in place may have had some effectiveness in preventing and controlling *T. evansi* infection. However, continuous monitoring and surveillance would still be necessary to detect any changes in prevalence and risk factors that may require adjustments in control strategies [3].

This study provided insights into the prevalence, risk factors, and parasitological examinations of *T. evansi* in camels in Bhakar, Pakistan. The overall prevalence rate observed was relatively low, with no significant differences in infection rates between the genders. While no statistically significant associations were found between the examined risk factors and *T. evansi* infection, further research would be warranted to explore other potential factors contributing to the transmission and control of *T. evansi* in camel populations. Such results could help inform camel health management and control strategies in Bhakar and similar camel-rearing areas in Pakistan [21].

CONCLUSION

This study conducted in Bhakar, Pakistan, provided important insights into the prevalence, risk factors, and parasitological examinations of *T. evansi* in camels. The observed relatively low prevalence

rate of *T. evansi* suggests that current control measures and management practices in place in Bhakar may have some effectiveness in preventing and controlling the infection. Although no significant associations were found between sex and *T. evansi* infection or the examined risk factors, further research is needed to explore other potential factors influencing the transmission and control of the parasite. The findings of this study serve as a valuable foundation for future studies and can guide camel health management and control strategies not only in Bhakar but also in similar camel-rearing areas in Pakistan. Continued surveillance and monitoring efforts are essential to detect any changes in prevalence and risk factors and to ensure the well-being and productivity of camel populations in the region.

CONFLICT OF INTEREST

None.

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