

HARD TICK INFESTATION ON DOMESTIC SHEEP IN DISTRICT KALAT, BALOCHISTAN

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DOI: <https://doi.org/10.5281/zenodo.7563858>

Received January: 10/2022.

Accepted January: 20/2022.

Published January: 25/2023.

Abstract

Hard ticks (Acari: Ixodidae) and their associated haemopathogens must be understood to assess the risk of pathogen exposure in people and animals. There is still a lack of knowledge, attitudes, and practices (KAP) to eliminate ticks and tick-borne diseases (TBDs) in Pakistan. In this study, farmers and ranchers in District Kalat, Balochistan, were interviewed about their concept of ticks and tick-borne diseases. A random questionnaire was distributed to farmers and ranchers, as well as face-to-face structured interviews. Hyalomma anatolicum, Hyalomma dromedarii, Rhipicephalus microplus and Rhipicephalus sanguineus were morphological identified. In spite of their extensive outdoor experience, farmers and ranchers often lack an understanding of ticks and the diseases they carry. A result of these circumstances is the failure of successful management strategies in the study area. Therefore, it is essential to carry out a nationwide survey to update the data presented in this research.

Keywords: Ticks, Infestation, Hyalomma, Anatolicum, Hyalomma, Sheep, Kalat

INTRODUCTION

Human and animal diseases are transmitted by ticks, which are hematophagous arthropods. Tropical and subtropical regions are experiencing an increase in the incidence of these diseases. Infectious diseases can be transmitted by ticks, making them a serious concern for public health and veterinary medicine. In addition to being obligate hematophagous arthropods, ticks are also classified as members of the order Ixodida (formerly known as the Metastigmata), class Arachnida, and subclass Acari. There are 896 species of ticks in three families: *Argasidae*, *Ixodidae*, and *Nuttalliellidae* (Guglielmone *et al.*, 2010). Because of the numerous zoonotic disease infections, they spread, ticks are the most prevalent ectoparasites harming the animal industries in many parts of the world. Which can result in poorer output, death, and other losses in domesticated animals.

In cattle alone, more than 3 billion pieces of hide and skin are in short supply because ticks cost \$13.9 to \$18 billion each year and transmit illnesses to Americans (Nyahangare,

2019). Tick infestations may substantially impair cattle and human health since ticks are known to carry a wide variety of illnesses, including protozoans, viruses, and bacteria like *spirochetes* and *rickettsia*. *Rhipicephalus*, *Haemaphysalis*, *Hyalomma*, and *Ornithodoros* are the main tick genera that infect both humans and animals in Pakistan (Sarwar, 2015).

Balochistan has been recognized as an important center in the world because of the current projection of the China-Pakistan Economic Corridor (CPEC) (Abbas *et al.*, 2019; Ahmed, 2019). The growth opportunities in the local livestock industry are expected to increase rapidly as the region opens up avenues for growth, leading to an increase in ticks and TBDs in the region. This region has seen repeated CCHF outbreaks since the drought of 2000. Besides the severity of security concerns, which were particularly severe between 2002 and 2015, there has been no research conducted in the field of ticks and their associated zoonotic risk factors in Balochistan. Ticks and TBDs have gained the attention of local researchers and government veterinary officials in this region. Therefore, there is a need to conduct a cross-sectional study to investigate various risk factors related to tick-borne disease spread among farmers. Keeping all these factors this work was conducted.

MATERIALS AND METHODS

STUDY AREA

In terms of area, Balochistan makes up 44% of Pakistan's total land area. With an area of 6,621 km², Kalat is the second-largest district in Balochistan. (Figure 1). Its population was 412,232 during the 2017-2018 census of Pakistan (Pakistan Census 2017). Kalat encompasses 1.91% geographical and 5.52% cultivated area (Asif, 2009). It has a desert climate with the limited number of rainfalls. The average temperature and rainfall are around 14.5°C and 181mm per year respectively. Six sampling sites were investigated over six months in 2022.

QUESTIONNAIRE DATA COLLECTION

An odds ratio analysis was performed on the survey data after it had been obtained from each sheep farm using only a predesigned questionnaire. To reduce misunderstanding and increase the accuracy of the answers, this questionnaire was translated into the local languages. The questionnaire was administered by students of Bachelor of Science who could speak Pashto and Afghan Persian, or Dari and then pre-tested with five farmers.

TICKS COLLECTION

Six months were spent collecting tick samples in 2022. Ticks were painstakingly inspected on every square inch of the body of each sheep. The ears, head, belly, fore and hind legs, and the inguinal and tail areas of the sheep were divided into three anatomical divisions for



the purpose of tick collection. Small forceps were used to remove the ticks, which were then individually put in 50-ml falcon tubes after being soaked in 90% ethanol. All samples were cleaned using an ultrasonic cleaner and sterile water.

RESULTS AND DISCUSSION

In socio-demographic study the majority of respondents were male $n=29$, 82.8%. Marital status of majority of them were married $n=30$, 85.70%. Our respondents were mostly belonging from Rural regions $n=27$, 77%. They were above than 18 years $n=32$, 91.4%. almost majority of them were illiterate $n=18$, 51.4%.

Table 1. Personal characteristics of farmers from the Kalat District participating in the survey (2022).

Demographic category	Frequency	Percentage
Gender		
Male	29	82.8
Female	6	17.2
Marital status		
Single	5	14.2
Married	30	85.7
Other/prefer not to answer		
Urbanicity of residence		
Urban	8	22.8
Rural	27	77.1
Age of the respondent		
Above 18	32	91.4
Below 60	3	8.5
Educational status		
Graduate degree or higher	5	14.2
Some college or two-year degree	2	5.7
Primary education	10	28.5
Never been to school	18	51.4

Table 2 gives detailed information regarding questionnaire study of farm owners and Ranchers. Both had very little information about ticks and TBDs ($n=29$, $p=0.03$). Knowledge of acaricides and anti-tick periodicity was found very less ($n=23$, $p=0.01$). Majority of the respondents were aware of effect of temperature on tick activity ($n=28$, $p=0.02$). Majority of them were removing ticks with bare hands ($n=32$, $p=0.2$). Majority of



the respondents did not seek treatment after a tick bite ($n=30, p=0.05$). They kept their farm animal with pet animals ($n=25, p=0.04$). Majority of them were not concern about tick bite or infection of TBDs ($n=32, p=0.2$). They crushed the ticks with bare hands ($n=22, p=0.01$). Check frequently animal body for presence of tick is very important for the health of farm animals but majority of farm owners were found deficient while performing this activity ($n=20, p=0.6$). Practice of adopting precautionary measures in farms were found very less ($n= 25, p=0.03$).

Table 2. Summary of KAP related questionnaire.

Questions	Response	Total	p-score
Knowledge about the ticks and tick-borne zoonotic diseases	Yes	6	0.03
	No	29	
Knowledge of acaricides and anti-tick periodicity	Yes	12	0.01
	No	23	
Does temperature effect the tick activity	Yes	28	0.02
	No	7	
Remove tick with bare hands	Yes	32	0.2
	No	3	
Treatment sought after a tick bite(s)	Yes	5	0.05
	No	30	
Kept farm animal with pet animals.	Yes	25	0.04
	No	10	
Concern about tick bite or infection of TBDs	Yes	3	0.2
	No	32	
Crushed the tick(s) by bar hands	Yes	22	0.01
	No	13	

A total of 1884 (712 males and 1172 females) were collected from the body of sheep in District Kalat, Balochistan, Pakistan. The highest prevalence of tick specie was *H. anatolicum* followed by *H. dromedarii*, *R. microplus* and *R. sanguineus*. Ticks (Acari: *Ixodida*) are obligate hematophagous arthropods (Galay *et al.*, 2015), that affect the animal businesses in many parts of the countries (Black and Piesman, 1994). Owing to the multiple zoonotic disease infections. They can cause a decrease in animal production, mortality, and other dropping to domesticated animals (De La Fuente *et al.*, 2003). Ticks which are divided into hard and soft ticks. Hard ticks are divided into three families including *Argasidae*, *Ixodidae*, and *Nuttalliellidae* (Black & Piesman, 1994). In Pakistan, the main tick genera are *Rhipicephalus Haemaphysalis*, *Hyalomma*, and *Ornithodoros*. More than 900 tick species have been documented globally, and they are split into two major families: *Ixodidae* and *Argasidae*, with the former being hard ticks and the latter being soft ticks (Jameson *et al.*, 2011).

Zoonosis account for on a worldwide level, there are around 60% of infectious illnesses that are known and up to 75% of infectious diseases that are developing or re-emerging (Thompson, 2000). Tick-borne zoonotic diseases are developed by several agents such as protozoans, fungi, bacteria, and viruses, these diseases are transmitted from animals to humans (Head *et al.*, 2020), and some times transmitted from humans to animals. Several tick-borne illnesses have re-surfaced and posing public health issues (Eisen *et al.*, 2017; Goodman *et al.*, 2005) for example, the United States spends between \$ 13.9 billion and 18 billion annually to control TBD (de Castro, 1997).

The most common pathogens transferred to domestic animals include *Anaplasma* sp., *Babesia* sp., *Borrelia* spp., *Ehrlichia* spp., and *Rickettsia* spp., (Georges *et al.*, 2001; Maggi *et al.*, 2014; Nijhof *et al.*, 2007). Over the past two decades, TBD has been the leading cause in the United States of vector-borne diseases (Parola *et al.*, 2018; Randolph, 2010). Tick infestations cause significant blood loss in animals, as well as the transmission of serious illnesses including theileriosis and *babesiosis*. The prevalence and spread of zoonosis are influenced by the migrations of domestic and wild animals.

Ticks and TBDs are very major vector of public health issues and animal diseases worldwide and have been the subject of previous studies in Pakistan. To date, there is very limited information is available about the distribution of hard tick infestations in farm animals in Pakistan. The results of this study show that four hard tick species from three genera infest farm animals, which agrees with previous studies in Pakistan. In this study, the number of ticks belonging to *Hyalomma* genus was found to be the highest.

Hyalomma anatolicum was found to be the most abundant tick in all investigated areas. This was followed by *H. dromedarii*, *R. microplus*, and *R. sanguineus*. The findings of these species have been reported in farm animals elsewhere (Garcia-Vozmediano *et al.*, 2020; Low *et al.*, 2015; Rafique *et al.*, 2015). It has been established fact from the other regions of the world that ticks such as *H. anatolicum* and dog tick *R. microplus* rarely attack humans (Parola *et al.*, 2008). However, this study did not report any tick infestations on farm managers and workers.

Table 3. The male and female frequency of collected ticks.

Animal	<i>H. anatolicum</i>		<i>H. dromedarii</i>		<i>R. microplus</i>		<i>R. sanguineus</i>	
	Male	Female	Male	Female	Male	Female	Male	Female
Sheep	380	690	180	250	102	150	50	80

CONCLUSION



Most tick species abundance and prevalence in recent years in Balochistan and other provinces of Pakistan is on the rise, particularly in species that are carriers of various pathogens. More efforts will be needed in the future to adequately investigate and address these phenomena.

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