

Research Article

Prevalence and taxonomic identification of hard ticks (Ixodidea) found in livestock of Harnai District, Balochistan, Pakistan

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Abstract

Ticks cause considerable damage to the livestock in tropical and subtropical areas. Because of climatic and environmental changes, the frequencies of tick-borne infections are increasing day by day. This research trial displays an outline about the different species of hard ticks (Family; Ixodidae) found in sheep, goats, cows, buffaloes and camels in District Harnai, Baluchistan. The study duration of the present research trial was from 1st December 2018 to 1st December 2019. Ticks were collected from different parts of the body and examined for species identification. Total 913 ticks were collected from livestock. Most susceptible animal was cow (65%) followed by buffalo (55%), camel (47.5%), sheep (30%) and goats (27.5%). Prevalence with respect to season, it was noted that, in summer season all hosts i.e. cows, buffalo, camels, goats and sheep were found to be highly infested while in winter infestation was low. In the current research trial, the prevalence of tick was high in cattle as compared to other livestock of Harnai District, Baluchistan. Nine species of ticks were identified in the study area as *Amblyomma variegatum*, *Amblyomma heberaeum*, *Rhipicephalus Boophilus*, *Hyalomma dromedarii*, *Rhipicephalus appendiculatus*, *Rhipicephalus boophilus microplus*, *Rhipicephalus Boophilus annulatus*, *Hyalomma anatolicum*, and *Ixodes rubicundus*. The widely spread and most prevalent species of tick were *Amblyomma heberaeum* and *Rhipicephalus appendiculatus*, while *Ixodes rubicundus* was the least prevalent specie. Favorable climatic conditions may be one of the reasons of this high prevalence of ticks in District Harnai.

Keywords: Cow; District; Harnai; Ixodidae; Prevalence; Tick

Introduction

Economy of Pakistan mainly depends on its livestock production as chief provider of food [1]. The domesticated animals are the vital piece of the economy of Pakistan and

viewed as the foundation of the rural economy as over 70% of the population lives in rural areas. People rely upon keeping domesticated animals for their survival [2].

Ticks are extremely well known specific group of obligate ectoparasites of birds, reptiles and mammals. They have blood sucking feeding habit [3]. There are three types of ticks identified as hard ticks, soft ticks and nuttalliella [4].

The differences between male and female ticks are following. The male have totally covered scutum and female covers only a portion of dorsal surface [5]. Ticks are economically responsible for great losses in cattle farming worldwide [6].

Ticks are the specific type of ectoparasites, which suck blood from warm blooded animals and have a potential to transfer parasites mostly in animals and rarely in humans. These parasites cause serious losses by spreading pathogens among animal populations [7].

Ixodidae family is one of the biggest groups of parasitic ticks in which about 13 genera and 650 species have been recognized [8]. Ticks of Ixodidae family transmit various bacterial, protozoal, rickettsial, spirochaetal and viral pathogens. The ixodid tick species are the most common tick parasites found in ruminants. Ticks have been thought as the critical danger because of their sensitivity and toxicity to animals. Ticks cause considerable damage to the assets of cultivating community particularly in tropical and subtropical areas [2].

Because of climatic and environmental changes, the frequencies of tick-borne infections are increasing day by day. It was accounted in an investigation that *H. aegyptium* is highly prevalent in different natural environments, for example, backwoods, forests, steps and deserts in the Palearctic region, Middle East, Northern Africa, Balkans and Central Asia [7].

A solitary female engorged tick can cause loss of 0.5– 2 ml of blood, 8.9 ml of milk and 1 g of body weight in ruminants daily. The worldwide economic loss due to tick invasion has been evaluated as US \$14,000– 18,000 million every year and it causes loss of US \$498.7 million in India each year [9].

This research trial displays an outline about the different species of hard ticks (Family; Ixodidae) found in sheep, goats, cow, buffaloes and camels in District Harnai, Baluchistan, Pakistan. Beside these, the present examination was incorporated to know the prevalence of ticks in relation to the months of the year, diverse season of the year and age of the animal [9].

Materials and methods

Study area

Balochistan being the largest province of Pakistan, spreading over an area of 350,000 sq/km. This study was conducted at randomly selected livestock farms of districts Harnai in the Balochistan province, Pakistan. The area is canal irrigated and heavily populated with livestock.

Study population

The samples were collected from Cattle (40), Camel (40), Goat (40) and Sheep (40), of Harnai District of Balochistan.

Study duration

The study duration of the present research trial was from 1st December 2018 to 1st December 2019.

Study design

To identify and determined the prevalence of hard ticks in livestock, ticks were collected from upper, lower, anterior and posterior parts of the body and examined for species identification.

Tick collection and preservation

Livestock were thoroughly inspected for ticks from every part of the body (ear, eye, testis, udder, vulva, tail, memory gland, abdominal and anal area). 30% alcohol was used to preserve ticks, after being separated from the host body.

Tick processing and identification

In lab separate the sample according to their specific features start the process including After boiling for 20-30 min in potassium hydroxide (KOH), the observed ticks were then passed through a series of grading level of alcohol (30%, 50%, 70%, 90% and 100%). Ticks were placed for 2 hours in each level of alcohol then transferred to the higher grade. Staining was done before transferring to 90% grade of alcohol. After

100%, finally ticks were placed in xylol for 5 seconds and then clove oil for few seconds. Ticks were mounted from Canada balsam after placing on slide. After processing all ticks were identified with the help of a microscope by taxonomy keys [10].

Sex determination

On the basis of scutum on the dorsum, female ticks had been separated and all ticks were identified for genus and specie level.

Results

The most susceptible animal was cow (65%) followed by buffalo (55%), camel (47.5%), sheep (30%) and goat (27.5%) as shown in (Table 1). The male and female were observed from every host i.e. cow, buffalo, camel, goat and sheep. It was noted that 48 males and 42 females were found infested (Table 1). Collectively, the prevalence rate was greater in males (48%) as compare to females (42%).

Nine species of ticks were identified in the study area as *Amblyomma variegatum*, *Amblyomma hebraeum*, *Rhipicephalus Boophilus*, *Hyalomma dromedarii*, *Rhipicephalus appendiculatus*, *Rhipicepalus boophilus microplus*,

Rhipicephalus Boophilus annulatus, *Hyalomma anatolicum*, and *Ixodes rubicundus*. The widely spread and most prevalent species of tick were *Amblyomma hebraeum* and *Rhipicephalus appendiculatus*, while *Ixodes rubicundus* was the least prevalent specie (Table 2).

In cow 133 ticks were males and females were 179. The total male: female ratio was (1:1.4), which showed dominancy of female ticks over males. in (sheep) 1:1.5,(cows) 1:1.2 and (camels)1:1.9 respectively.

Rhipicepalus Boophilus was observed in maximum number as larvae N (10) and nypm N (19) in while *Amblyomma hebraeum* was detected in highest number as adult N (72) (Table 3).

In summer season all hosts i.e. cows, buffalo, camels, goats and sheep were found to be highly infested while in winter infestation was low. In July high number of ticks were collected, which was followed by August (Table 4), while in February, minimum number of ticks were observed on cattle. This proved a direct association of tick's prevalence with increased temperature. Humidity and temperature may influence tick infestation.

Table 1. Prevalence of ticks in livestock of Harnai District, Balochistan

Host	Observed			Infested			Prevalence %		
	M	F	Total	M	F	Total	M	F	Total
Cow	20	20	40	16	10	26	40	25	65
Buffalo	20	20	40	9	13	22	22.5	32.5	55
Camel	20	20	40	9	10	19	22.5	25	47.5
Goat	20	20	40	6	5	11	15	12.5	27.5
Sheep	20	20	40	8	4	12	20	10	30
Total	100	100	200	48	42	90	120	105	45

Table 2. Total no. of ticks and their percentage with respect to identified specie in various hosts in Harnai district, Balochistan

Host	Total no of ticks	Species of ticks	No	Percentage %
Cow	312	<i>Amblyomma hebraeum</i>	23	7.37
		<i>Amblyomma variegatum</i>	34	10.89
		<i>Hyalomma dromedarii</i>	40	12.82
		<i>Ixodes rubicundus</i>	35	11.21
		<i>Rhipicepalus Boophilus</i>	97	31.08
		<i>Rhipicepalus appendiculatus</i>	83	26.60
Buffalo	269	<i>Amblyomma hebraeum</i>	88	32.71

		<i>Hyalomma anatolicum</i>	44	16.35
		<i>Hyalomma dromedarii</i>	35	13.01
		<i>Rhipicepalus Boophilus</i>	40	14.86
		<i>Rhipicepalus appendiculatus</i>	62	23.04
Camel	106	<i>Amblyomma hebraeum</i>	13	12.26
		<i>Amblyomma variegatum</i>	19	17.92
		<i>Hyalomma dromedarii</i>	19	17.92
		<i>Rhipicepalus boophilus microplus</i>	23	21.69
		<i>Rhipicepalus aappendiculatus</i>	32	30.18
Goat	90	<i>Amblyomma hebraeum</i>	28	31.11
		<i>Hyalomma anatolicum</i>	1	23.33
		<i>Hyalomma dromedarii</i>	19	21.11
		<i>Rhipicepalus boophilus annulatus</i>	22	24.44
Sheep	136	<i>Hyalomma anatolicum</i>	34	25.00
		<i>Hyalomma dromedarii</i>	38	27.94
		<i>Rhipicepalus boophilus annulatus</i>	39	28.67
		<i>Rhipicepalus boophilus microplus</i>	25	18.38
Total	913			

Table 3. Different life stages of ticks in livestock of Harnai, District Balochistan

Host	Total No. of ticks	Species of ticks	No.	Sex		Life's stage		
				Male	Female	Larvae	Nymph	Adult
Cow	312	<i>Amblyomma hebraeum</i>	23	8	15	3	6	14
		<i>Amblyomma variegatum</i>	34	11	23	4	8	22
		<i>Hyalomma dromedarii</i>	40	25	15	4	13	23
		<i>Ixodes rubicundus</i>	35	10	5	6	9	20
		<i>Rhipicepalus Boophilus</i>	97	43	54	10	19	68
		<i>Rhipicepalus appendiculatus</i>	83	36	47	6	15	62
Buffalo	269	<i>Amblyomma hebraeum</i>	88	31	57	5	11	72
		<i>Hyalomma anatolicum</i>	44	20	24	2	5	37
		<i>Hyalomma dromedarii</i>	35	20	15	4	6	25
		<i>Rhipicepalus Boophilus</i>	40	15	25	3	9	28
		<i>Rhipicepalus appendiculatus</i>	62	20	42	7	17	38
Camel	106	<i>Amblyomma hebraeum</i>	13	8	5	2	4	7
		<i>Amblyomma variegatum</i>	19	6	13	3	5	11
		<i>Hyalomma dromedarii</i>	19	14	5	1	3	15
		<i>Rhipicepalus boophilus microplus</i>	23	15	8	2	6	15
		<i>Rhipicepalus appendiculatus</i>	32	11	21	5	7	20
Goat	90	<i>Amblyomma hebraeum</i>	28	9	19	3	4	21
		<i>Hyalomma anatolicum</i>	21	15	6	2	5	14

		<i>Hyalomma dromedarii</i>	19	11	8	3	4	12
		<i>Rhipicepalus boophilus microplus</i>	22	5	17	1	3	18
Sheep	136	<i>Hyalomma anatolicum</i>	34	6	33	2	5	32
		<i>Hyalomma dromedarii</i>	38	26	12	2	3	33
		<i>Rhipicepalus boophilus annulatus</i>	39	6	33	2	5	32
		<i>Rhipicepalus boophilus microplus</i>	25	6	19	1	2	22
Total	913			379	534	82	173	658

Table 4. Seasonal wise distribution of ticks in livestock of Harnai district, Balochistan

Season	Months	Number of ticks					Total
		Cow	Buffalo	Camel	Goat	Sheep	
Spring	March	17	5	2	3	3	30
	April	11	8	4	4	5	32
	May	12	21	5	6	9	53
Summer	June	34	30	13	8	14	99
	July	92	88	21	19	39	259
	August	83	62	19	15	29	208
Autumn	September	23	19	16	12	12	82
	October	18	15	10	11	10	64
	November	17	9	9	6	8	49
Winter	December	3	7	5	4	5	24
	January	1	3	1	1	1	7
	February	1	2	1	1	1	6
	Total	312	269	106	90	136	Grand total =913

Discussion

The most susceptible animal was cow (65%) followed by buffalo (55%), camel (47.5%), sheep (30%) and goat (27.5%) as shown in Findings of Walker *et al.*, [10] are in the line with these results, who reported tick infestation 33.7% in cattle, 22.8% in buffaloes, 16.67% in goats and 10.4% in sheep in N.W.F.P. Similar result was reported by Khan, [11] who observed highest susceptibility of cattle for tick infestation.

A total 100 male and female were observed from every host i.e. cow, buffalo, camel, goat and sheep. It was noted that 48 males and 42 females were found infested collectively, the prevalence rate was greater in males (48%) as compare to females (42%). This result is in the line with

Hitcheock, [12]. The authors stated the reason of increased rate of male prevalence that male animals are usually practiced in farming. They travel from one place to other and acquire tick infection [13]. Although in buffaloes and camels, the rate of infestation was greater in females than males (32.5% and 22.5% respectively). It can be presumed that increased concentration of prolactin and progesterone hormones in females may be one of the reason of this high prevalence of females. Furthermore, lactation and stress from pregnancy could contribute to increase susceptibility of female animals to infections.

Nine species of ticks were identified in the study area as *Amblyomma variegatum*, *Amblyomma heberaeum*, *Rhipicephalus*

Boophilus, *Hyalomma dromedarii*, *Rhipicephalus appendiculatus*, *Rhipicephalus boophilus microplus*, *Rhipicephalus Boophilus annulatus*, *Hyalomma anatolicum*, and *Ixodes rubicundus*. The widely spread and most prevalent species of tick were *Amblyomma hebraeum* and *Rhipicephalus appendiculatus*, while *Ixodes rubicundus* was the least prevalent specie (Table 5). This further indicated that the finding of this tick in the area is in line with its wide spread occurrence in most parts of the country. *Hyalomma* and *Rhipicephalus* had also been confirmed from elevated and hilly areas and from grasslands areas of Pakistan [14]. The authors examined 813 cattle in Gilgit Baltistan and Khyber Pakhtunkhwa. It was observed that the rate of prevalence of *Hyalomma anatolicum* and *Rhipicephalus microplus* was exceedingly high as compare to other species. In another study. Khalil *et al.* [15]. found *Hyalomma* as highly prevalent specie with a rate of 44.5% prevalence in buffaloes of Jampur District, South Punjab, Pakistan. Esmail & Ahari, [16]; Radfar [17] also stated *Hyalomma* as dominating specie over other species of ticks.

In cow 133 ticks were males and females were 179. The total male: female ratio was

(1:1.4), which showed dominancy of female ticks over males. in (sheep) 1:1.5, (cows) 1:1.2 and (camels) 1:1.9 respectively.

Rhipicephalus Boophilus was observed in maximum number as larvae N (10) and nymf N (19) in while *Amblyomma hebraeum* was detected in highest number as adult N (72).

In summer season all hosts i.e. cows, buffalo, camels, goats and sheep were found to be highly infested while in winter infestation was low. In July high number of ticks were collected, which was followed by August, while in February, minimum number of ticks were observed on cattle. This proved a direct association of tick's prevalence with increased temperature. Humidity and temperature may influence tick infestation [18]. Findings of Das, [19-21] are also in the agreement of this result. The author observed a similar trend of tick's infestation in cattle and buffalo highest from June to September and lowest from November to February. Tadesse *et al.*, [22] also observed July as the month of highest prevalence (57.3%) and November as lowest (36.4%). Sanjay *et al.* [23] Stuti-Vatsya *et al.*, [24]; Gosh, *et al.* [25] reported rainy season as highly prevalent and winter as least prevalent season for cattle.

Table 5. Sex wise distribution of identified tick specie in livestock of Harnai District, Balochistan

Host	Total No. of ticks	Species of ticks	No.	Male	Female	Male /Female ratio
Cows	312	<i>Amblyomma hebraeum</i>	23	8	15	1.6:1
		<i>Amblyomma variegatum</i>	34	11	23	1:2.0
		<i>Hyalomma dromedarii</i>	40	25	15	1.6:1
		<i>Ixodes rubicundus</i>	35	10	25	1:1.8
		<i>Rhipicephalus Boophilus</i>	97	43	54	1:1.2
		<i>Rhipicephalus appendiculatus</i>	83	36	47	1:30
		Total	312	133	179	
Buffalo	269	<i>Amblyomma hebraeum</i>	88	31	57	1:1.8
		<i>Hyalomma anatolicum</i>	44	20	24	1:1.2
		<i>Hyalomma dromedarii</i>	35	20	15	1.3:1
		<i>Rhipicephalus Boophilus</i>	40	15	25	1:1.6
		<i>Rhipicephalus appendiculatus</i>	62	20	42	1:2.1

		Total	269	106	163	
Camel	106	<i>Amblyomma hebraeum</i>	32	11	21	1:1.9
		<i>Amblyomma variegatum</i>	19	6	13	1:2.1
		<i>Hyalomma dromedarii</i>	19	14	5	2.5:1
		<i>Rhipicepalus boophilus microplus</i>	22	15	8	1.8:1
		<i>Rhipicepalus aappendiculatus</i>	32	11	21	1:1.9
		Total	106	54	52	
Goat	90	<i>Amblyomma hebraeum</i>	28	9	19	1:2.1
		<i>Hyalomma anatolicum</i>	21	15	6	2.5:1
		<i>Hyalomma dromedarii</i>	19	11	8	1.8:1
		<i>Rhipicepalus boophilus annulatus</i>	22	5	17	1:3.4
		Total	90	40	50	
Sheep	136	<i>Hyalomma anatolicum</i>	34	8	26	1:3.25
		<i>Rhipicepalus boophilus annulatus</i>	39	6	33	1:5.5
		<i>Rhipicepalus boophilus microplus</i>	25	6	19	1:3.1
		<i>Hyalomma dromedarii</i>	38	26	12	2.1:1
		Total	136	46	90s	
Total	913		379	534	1:1.4	

Conclusion

In the current research trial, tick prevalence was observed in cattle from Harnai District, Baluchistan. Nine species of ticks were identified in the study area as *Amblyomma variegatum*, *Amblyomma hebraeum*, *Rhipicephalus Boophilus*, *Hyalomma dromedarii*, *Rhipicephalus appendiculatus*, *Rhipicepalus boophilus microplus*, *Rhipicephalus Boophilus annulatus*, *Hyalomma anatolicum*, and *Ixodes rubicundus* the widely spread and most prevalent species of tick were *Amblyomma hebraeum* and *Rhipicephalus appendiculatus*, while *Ixodes rubicundus* was the least prevalent specie. In general, due to unsatisfactory tick control measures and lack of awareness about effective control strategies, ticks were highly prevalent in cattle in the study area. Favorable climatic conditions may be one of the reason of this high prevalence of ticks in District Harnai. The ixodid tick have been thought as the critical danger to cattle because of their sensitivity and toxicity to

animals and accountable for severe financial losses through impairment to hide and by spreading various diseases through blood sucking. Consequently, it is necessary to control tick infestation in cattle to reduce the loss. Use of acaricide could be a good mechanism to minimize tick infestation. Further studies on the impact of environment on tick infestation, other risk factors and as well as effective tick controlling strategies are suggested in the area as per current finding.

Authors' contributions

Conceived and designed the experiments: S Bibi, N Rafiq & MK Taj, Performed the experiments: S Bibi, K Iqbal, M Shafiq, Analyzed the data: S Bibi, N Rafiq & MK Taj, Contributed materials/ analysis/ tools: S Bibi, A Bibi, G Ghafoor & A Ghafoor, Wrote the paper: S Bibi, A Ijaz & MK Taj.

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