

Bionomics of Hard Ticks and Risk Factors in Larkana Division, Sindh, Pakistan



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Abstract

Background: A study based on discovery of Ixodid ticks and allied risk factors was conducted in Larkana division, Sindh, Pakistan. The ticks (Acari:Ixodidae) being dangerous ectoparasites of animals have destruction on larger scale and are widely studied for their direct and indirect losses to livestock.

Methods: During the study period from April 2021 to June 2022 randomly selected 3750 buffaloes were observed and only those were selected which were not treated with Acaricide and prevalence and intensity was noted alongside this seasonal variation and male and female tick infestation was also reported.

Results: The collective infestation in buffaloes was 46.90% (n=1759) and its peak was reported during August and least infestation was in December, two species were discovered *Hyalomma marginatum* and *Hyalomma truncatum*.

Conclusion: This study concludes that well-being of animal-handlers and livestock is on danger.

Keywords: Prevalence, intensity, risk, *Hyalomma truncatum*, *Hyalomma marginatum*

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Introduction

The continents are enriched with tick fauna even they are found on seabird's protectorate from North to South hemispheres (1). The ticks (Acari:Ixodidae) feeds on blood of all forms of terrestrial animals which includes birds, reptiles and mammals and are served as pathogenic vectors (2). The mosquitoes greatly spread diseases and are followed by ticks (Acari:Ixodidae) which affect tropics and subtropics (3). The transmission of pathogens like protozoan, virus and bacteria which ultimately cause diseases like babesiosis, anaplasmosis, theileriosis, ehrlichiosis and haemorrhagic fever are the outcomes of ticks (Acari:Ixodidae) (4,5). Their nature shows dual characters vector and reservoir of infectious agents like *Salmonella typhimurium*, *Pasteurella multocida* and *Brucellabortus*, animals and humans are affected (6). The genus *Hyalomma* is abundant in China, Middle East, Central Asia, North Africa and Southern Europe and is prime cause of theileriosis (7). They transmit helminthes and viruses (8). The countries like Pakistan, Bangladesh and India are potentially affected by tick-borne diseases because these countries have tropical and subtropical environment suitable for ticks (Acari:Ixodidae) growth (9). The Pakistan, Bangladesh and India are affected most due to negligence (10). By transmitting pathogens of viruses, rickettsia, bacteria and protozoans to reptiles, birds and

mammals results in reduction in livestock which leads to mortality (11). Ticks (Acari:Ixodidae) feed on blood and develop myiasis and dermatophilosis which destroy skin and hides of cattle (12). The protozoan diseases such as Equine piroplasmiasis and theileriosis are also result of ticks (Acari:Ixodidae). While talking to economic perspective specifically livestock of Pakistan which bestow not only jobs but also meet the need of meat, milk and leather of country. The Pakistani atmosphere provides an appropriate environment having humid and hot parameters fit for parasites like ticks (Acari:Ixodidae) (13). Tick infestation in Pakistan is obvious because it has wide variety of genera and species (1). But data on tick infestation and tick-borne diseases is not sufficient (14, 15). An agricultural land of Pakistan constitutes 769.0 million livestock including 30.8 million buffaloes (16). The miniature farmers keep 98% buffalo population domestically not more than five animals on two hectors land or less (17). When comparing to cow, buffalo is highly beneficial, health and product wise particularly for Asian poor farmers (18). In Pakistan buffaloes leading production of meat and milk and is followed by cattle. The statistics shows production of milk in Pakistan 71% is gained by buffaloes with 155.6 L/Y per capita (17). In present study two species *Hyalomma marginatum* and *Hyalomma truncatum* were found infesting. Koch in 1844 discovered *Hyalomma marginatum* (19). It is also known as Mediterranean *Hyalomma*. Medically

important species spread *Theileria annulata* and cause babesiosis in horses. Humans are at risk it cause Crimean-Congo haemorrhagic fever. It feed on horses, donkeys, cattle, buffaloes, sheep, goats, camels, birds, hares, hedgehogs, and rodents and is a two-host tick species. It extends in various continents by affixing itself to passerine birds for 26 days (20). And *Hyalomma truncatum* is commonly known as shiny *Hyalomma*, it is named due to glossy surface of male ticks. It is also lifted by Koch in 1844. It infests cattle, buffaloes, sheep, goats, camels, horses, giraffes, dogs and donkeys. The two-host tick species transmit bacterium *Rickettsia conorii* in humans and develop tick typhus. The saliva of this species has a toxin which causes sweating sickness in cattle and calves. Its long mouthparts damage tissues and develop secondary bacterial infection (21).

The hazards caused by ticks (Acari: Ixodidae) are discussed above meticulously in addition to this a very recent study was plotted by El-Alfy et al. (22) who meta-analysed global prevalence in buffaloes, they finished with validation of species of *Babesia*, *Theileria*, and *Anaplasma* spreading diseases among buffaloes on larger scale. Concluding the facts and figures stated above, the current research was aimed to gather knowledge about tick infestation and damages caused by them in Larkana division, Sindh Pakistan.

Our study aimed to: (1) explore ticks (Acari: Ixodidae), their infestations and associated risks along with possible solutions, (2) contribute to the scientific literature of parasites generally and in buffaloes specifically, and (3) disseminate information for the prevention of animal handlers from tick infestation.

Methodology

This study was conducted in Larkana division which has two kinds of severe seasons; scorching summer up to 53 °C and coolest winter falls -2 °C, and with maximum humidity of 85% (23). The Larkana division has Jacobabad, Kashmore, Shikarpur, Qambar Shahdadkot and Larkana districts. The latitude and longitude of above districts are 28° 16' 51.60" N and 68° 26' 19.54" E, 28.432997, 69.583710, 27.9709° N 68.6201° E, 27° 50' 59.99" N 67° 53' 59.99" E and 24 56' 00" and 67 11' 00" respectively (24,25,26,27).

The fortnightly collections were made from all districts and forceps were used for removing ticks (Acari: Ixodidae) from host body. After assessing the host populations in studied localities in current research 3750 buffaloes were randomly observed after getting consent from farm owners during the period of April 2021-June 2022. The constant sample size (n=250) for observation in each month was ensured. Anti-tick treatments were also noted.

The ticks (Acari: Ixodidae) were placed in 70% ethanol and were stocked at the Parasitological Laboratory, Department of Zoology, University of Sindh, Jamshoro.

During the ticks (Acari: Ixodidae) collection April 2021-June 2022, humidity and temperature were noted by using hygrometer and then data was analyzed with meteorological observations of the department of meteorology, Larkana, Sindh, government of Pakistan as stated in table 5.

The ticks (Acari: Ixodidae) were identified by using standard keys (28,29,30,31,32,33). For this (4X) and compound (10X) dissecting microscopes were used.

For prevalence the formula, total host animals infested/total host animals observed x100 P= prevalence was used (34) and intensity was seen with the formula, No of collected specimens/No of infected hosts (35). For data verification excel 2007 was used.

This study was conducted with the administrative permission and ethical approval from the respective competent authority and ERB of University of Sindh, Jamshoro.

Results

In present research 3750 buffaloes came under observation with sample size 250 animals in each month, these animals were randomly selected. The infestation recorded 46.90% (n=1759) while these animals were not treated with acaricide (table 1) During the study it was noted that highest infestation was recorded in the month of August 74.4% (n=186) and lowest infestation was observed during the month December 12.8% (n=32) while these results were analyzed with meteorological data obtained from the meteorology department Larkana, Sindh, Pakistan which indicating environmental factors have influence on both minimum and maximum infestations (table 5). The species recovered during present study were *Hyalomma truncatum* and *Hyalomma marginatum*. The specimens of *Hyalomma marginatum* were 970 and mean intensity was recorded 0.55. The male ticks were most abundant (n=697) in comparison to female ticks (n=273) and peak of mean intensity was seen during the month of May 0.84 while minimum mean intensity was recorded in March 0.26 (table 2) and prevalence was 47.71% (table 4). The total no of ticks of *Hyalomma truncatum* were 1063 and mean intensity during entire study period was recorded 0.60. This species also have most abundant no of male ticks (n=758) and least no of female ticks (n=305) while peak of mean intensity was recorded in December 1.09 and minimum least intensity was reported in March 0.27 (table 3) and prevalence was 52.28% (table 4). While comparing infestation of both species, the most prevalent species was *Hyalomma truncatum* (figure 1)

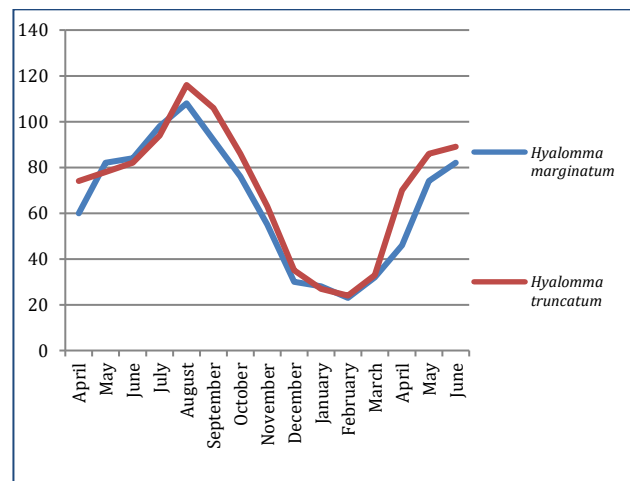


Figure 1: showing comparative analysis of infestation of *Hyalomma marginatum* and *Hyalomma truncatum* on buffaloes from Larkana, Sindh, Pakistan.

Table 1: showing monthly prevalence (%) of ticks on buffaloes from Larkana, Sindh, Pakistan.

Months	Observed animals	Infested animals	Prevalence %
April	250	111	44.4
May	250	97	38.8
June	250	116	46.4
July	250	158	63.2
August	250	186	74.4
September	250	168	67.2
October	250	133	53.2
November	250	74	29.6
December	250	32	12.8
January	250	61	24.4
February	250	72	28.8
March	250	121	48.4
April	250	134	53.6
May	250	145	58
June	250	151	60.4
Total	3750	1759	46.90

Table 2: showing monthly (n=250) prevalence (%) and intensity of *Hyalomma marginatum* on buffaloes (Total=3750) from Larkana, Sindh, Pakistan

Month	<i>Hyalommamarginatum</i>			
	Male	Female	Total	Mean intensity
April	42	18	60	0.54
May	62	20	82	0.84
June	66	18	84	0.72
July	74	24	98	0.62
August	78	30	108	0.58
September	68	24	92	0.54
October	53	23	76	0.57
November	37	18	55	0.74
December	21	09	30	0.93
January	19	09	28	0.45
February	17	06	23	0.31
March	21	11	32	0.26
April	31	15	46	0.34
May	51	23	74	0.51
June	57	25	82	0.54
Total	697	273	970	0.55

Table 3: showing monthly (n=250) prevalence (%) and intensity of *Hyalomma truncatum* on buffaloes (Total=3750) from Larkana, Sindh, Pakistan

Month	<i>Hyalommatruncatum</i>			
	Male	Female	Total	Mean intensity
April	54	20	74	0.66
May	56	22	78	0.80
June	62	20	82	0.70
July	70	24	94	0.59
August	82	34	116	0.62
September	78	28	106	0.63
October	57	29	86	0.64
November	43	20	63	0.85
December	25	10	35	1.09
January	19	08	27	0.44
February	17	07	24	0.33
March	23	10	33	0.27
April	49	21	70	0.52
May	59	27	86	0.59
June	64	25	89	0.58
Total	758	305	1063	0.60

Table 4: showing comparative analysis of prevalence (%) of *Hyalomma marginatum* and *Hyalomma truncatum* on buffaloes from Larkana, Sindh, Pakistan.

Species	<i>Hyalomma marginatum</i>	<i>Hyalomma truncatum</i>
Male ticks	273	758
Female ticks	697	305
Total	970	1063
Prevalence %	47.71	52.28

Table 5: showing meteorological observations in division Larkana from April 2021 to June 2022

Months	Rainfall	Temperatures			Relative Humidity %	
	Mm	Min: °C	Max: °C	Average °C	8.00 AM	5.00 PM
April	4.0	24.5	44.0	40.0	70	38
May	00	30.2	47.5	43.5	73	44
June	50.0	30.0	44.5	44.5	77	54
July	00	30.0	45.0	42	78	58
August	00	28.0	41.5	40.0	85	54
September	10.0	30.0	41.5	37.5	86	61
October	00	27.0	37.5	33.0	85	65
November	00	11.00	35.0	27.0	81	49
December	00	9.0	21.5	20.0	88	64
January	00	9.0	27.5	21.0	87	63
February	00	11.5	30.0	24.5	80	60
March	2.0	23.5	42.5	38	70	38
April	00	25.0	45.00	41.0	72	38
May	00	31.0	48.0	44.0	74	39
June	6.0	30.0	53.0	44.5	80	50

Discussion

The findings in present research urge 46.90% (n=1759) prevalence in buffaloes which is almost in accordance with Ghafaret, al. who reported 46.1% from five agro-ecological zones of Pakistan however, they investigated buffalo along with cattle (36). The present study didn't agree with Tasawar et al.(37)who recorded 52.5% in Bibipur of Multan, Pakistan. The present study also disagree with Durrani et al. (38), they discovered 66.7% prevalence in Lahore, Pakistan, Sajid et al. (39) discovered 75.1% prevalence in lower Punjab, Pakistan, the possible reason for this could be these findings are very old and sample size is also different. The current study disagrees with Hussain et, al. (40) they reported 11.7% prevalence from different agro-ecological zones in Pakistan this might be because of sample selection size. The present study revealed highest infestation was in the month of August which is almost in agreement with Wahid et al. (41) who described August, September and October most prevalent months. The present study is contradictory to Nausheen et al. (42), according to their findings highest prevalence was seen in May-July 2009 in BLPRI. The current research disagree with Sayin et al.(43)and Aktas et al.(44)according to them female ticks were most abundant while in present study male ticks were more abundant, Gharbi et al. (45)described this phenomenon of greater number of male ticks might be because they are mobile and have capability for a brief time to append themselves. The present study did not agree with Belabed and Zediri (46) because *Hyalomma marginatum* was 47.71% prevalent in current findings whereas they accounted 5.94% in Northeastern Algeria, this diversion in

results might be due to variation in the collection, they recovered them through pasture areas whilst presently they were recovered from buffaloes. The current findings also disagree with Davari et al. (47), according to their research it was 1.45% prevalent on cattle in Iran in addition present research differ from findings of Durrani et al.38as they discovered its prevalence 20.8% on cattle from Punjab, Pakistan this might be due variation in environmental factors, sample sizes and host animals. The present findings does not go in accordance with Moges et al. (48) as they concluded infestation of *Hyalomma truncatum* 3.25% on cattle in Northwest Ethiopia while present study suggests its infestation 52.28% on buffaloes this could be because sample size and host was change.

Conclusion

Hyalomma truncatum and *Hyalomma marginatum* are medically crucial species and are greatly found on buffaloes of Larkana division. Their infestation was noted 52.28% and 47.71% respectively. The mean intensity of *Hyalomma marginatum* was 0.55 and *Hyalomma truncatum* was 0.60 while with regard to prevalence highly favourable month was August 74.4% and least prevalence was reported in December 12.8% and overall prevalence was 46.90%. So people and livestock are at high risk of tick infestation.

Recommendations:

The findings in this paper recommend the study on the tick infestations should be extended and other parts of country and livestock should be investigated. Health of peoples and livestock is on risk so prompt precautionary measures should be taken in Pakistan, awareness and tick safety campaigns should be started and farmers should be educated to prevent themselves from tick infestation.

Limitations of Study:

This study was conducted only in Larkana division hence results cannot be generalized.

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