



## Taxonomic identification of ticks found in domestic animals in arid zone area of Khyber Pakhtunkhwa, Pakistan

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Ticks are obligate ectoparasites of domestic as well as wild animals all over the globe. Ticks are considered to be second most important ectoparasite after mosquitoes as vectors of diseases. The most commonly transmitted diseases are Crimean Congo hemorrhagic fever virus, *Anaplasma*, *Borrelia*, *Rickettsia*, *Babesia* spp., *Francisella*, *Bartonella*, *Ehrlichia* and *Coxiella*. Ticks have widely distributed in various areas of country but this is the only single and first study in the current area which was conducted in Tehsils Paharpur and Dera Ismail Khan to identify the tick genera. A survey was conducted to collect the tick from domesticated animals (buffaloes, cows, goats and sheep). The ticks were collected in collection vials containing 70% Ethyl Alcohol as preservative and brought to laboratory for identification. The identification of tick to genus level was done under microscope. Seven genera *Rhipicephalus*, *Hyalomma*, *Haemaphysalis*, *Amblyomma*, *Dermacentor*, *Ixodes* and *Boophilus* were identified in the current study. Tick infestation was recorded maximum in buffaloes followed by cows, sheep and goats. The most common tick species are assumed to be responsible for the transmission of tick-borne infections in addition to inflicting physical harm to the skin. The findings of current study provide additional information of tick genera and their infestation on domesticated animals, and will be helpful in adopting suitable management strategies against ticks on domestic animals.

**Keywords:** Livestock; Tick; Ectoparasites; Infestation; *Hyalomma*; *Amblyomma*

### INTRODUCTION

The domesticated animals are the main part of backbone of Pakistan's economy called Agriculture. These are the main source of income for farmers and employment to poor people in the world especially Pakistan. These are working as natural factories in converting grasses, shrubs and weeds into various useful products such as meat and milk. Their proteins carry high nutrients or amino acid than vegetables proteins. Animals are reared at small as well as large scale in Pakistan to obtain different products such as meat, milk, wool, butter and protein etc. The productivity of domestic animals is highly reducing due to various biotic and abiotic factors. The biotic factors such as ticks are playing key role in the reduction of animal production (Ghafar et al. 2020).

Ticks belong to order Acari, obligate endophilic or exophilic parasites of all vertebrates in various regions of the world especially tropical and subtropical (Ramzan et al. 2021, Rahman et al. 2022). These are closely resembled to mites, scorpions, harvestmen and spiders. These are the vector of several viral, bacterial and fungal diseases that transmitted into human, terrestrial and aquatic creatures (animals and birds) (Moges et al. 2012; Adams et al. 2015) of the world.

Three families of ticks (Ixodidae, Argasidae and Nuttalliellidae) comprises several ticks species. Approximately, 700 species of Ixodidae (hard ticks), 200 argasidae (soft ticks) and only one species of Nuttalliellidae had been reported yet in the whole world. The domestic animals (buffaloes, cows, goats and sheep)

are the major hosts of ticks and ticks-borne diseases (TBDs). Among domestic animals, high infestation of ticks and TBDs had reported on cows and buffaloes which mostly loaded with various tick species as discussed by many taxonomists in the world.

It has been reported that 80% of the world's animal population affected through TBDs (Marcelino et al. 2012; Kabair et al. 2011). Hard ticks (Ixodidae) are the major threat for human being and animals all over the world (Abebe et al. 2010; Collatz et al. 2011; Riabi and Atarodi 2014) including Pakistan (Ramzan et al. 2018).

The favorable environmental conditions of Pakistan are suitable for tick production and growth (Jabbar et al. 2015; Ramzan et al. 2018). The tick infestation is increasing day by day and becoming major threat for livestock production in the country. There is need to identify which tick species is most dangerous for animals in the study area. The current study was conducted to full fill this aim.

## MATERIALS AND METHODS

### Location and climate of study area

The current study was conducted at Paharpur and Dera Ismail Khan, Tehsils of district Dera Ismail Khan Pakistan. The study area is located at latitudes 30.2°N and longitudes 71.4°E which lies between altitudes 123 m above sea level. The climate is arid, extensively hot in summer while cold in winter.

### Tick collection

For tick collection, 10 farms from each tehsil were randomly selected and 20 buffaloes, 20 cows, 10 sheep and 10 goats from each farm were examined. Tick specimens were collected by using the procedure of early scientists (Ramzan et al. 2020; Jamil et al; 2021; Jamil et al. 2022).

### Preservation and Identification of tick species

The collected specimens were preserved in 70% Ethyl Alcohol and identified to species level under high power microscope in laboratory using taxonomic key.

## RESULTS AND DISCUSSION

The domestic animals are the source of majority Pakistani inhabitants. The people rear the animals at their houses and earn money from their products such as wool, skin, meat and milk. The production of animals is decreasing day by day due to various ectoparasites and endoparasites. Ticks are ectoparasites of domestic as well as wild animals all over the world especially in tropical and subtropical regions. Among four families, three are extant (Ixodidae, Argasidae and Nuttalliellidae) families while one extinct (Deinocrotonidae) (Dantas-Torres et al. 2019). More than 956 tick species had been reported yet in the world from four families (Du et al. 2018; Kwak et al. 2018; Apanaskevich et al. 2019; Sun et al. 2019). These reported species caused mortality and morbidity of

livestock and human beings. These blood sucking arthropods are increasing day by day due to environmental conditions and trade. These are causing huge economic losses all over the world especially Pakistan.

The current study was conducted to check tick species which are distributed in study area. It was observed that genera *Hyalomma* and *Amblyomma* were found on all examined domestic animals while *Rhipicephalus* collected from buffaloes and cows not from sheep and goats (Table 1). Genera, *Hyalomma* and *Amblyomma* are the main problem from domestic as well as wild animals in all areas of Northern and Southern Punjab Pakistan. Sex wise tick infestation on domestic animals in the study area has given in table 3.

**Table 1: Animals wise prevalence rate**

Genera	Buffaloes	Cows	Sheep	Goats
<i>Amblyomma</i>	+	+	+	+
<i>Boophilus</i>	-	-	+	+
<i>Dermacentor</i>	-	-	+	+
<i>Haemaphysalis</i>	-	+	+	+
<i>Hyalomma</i>	+	+	+	+
<i>Ixodes</i>	-	+	-	-
<i>Rhipicephalus</i>	+	+	-	-

Ticks are the vector of various diseases such as theileriosis, anaplasmosis, babesiosis and piroplasmosis in domestic and wild animals all over the world including Pakistan (Ramzan et al. 2018). The maximum infestation of *Haemaphysalis* and *Dermacentor* had been recorded on domestic animals in tehsil Shujabad (Ramzan et al. 2020) while in the current study *Hyalomma* and *Rhipicephalus* were found with maximum percentage on all domestic animals in the study area (Table 2). Among identified tick genera, *Hyalomma* was found in highest percentage followed by *Rhipicephalus*, *Haemaphysalis*, *Amblyomma*, *Dermacentor*, *Ixodes* and *Boophilus*. *Hyalomma anatolicum* was widely distributed in all regions of Pakistan including the current study area (Rehman et al. 2017). Our current study observations are also similar to previous ticks taxonomists (Ramzan et al. 2021; Jamil et al. 2021; Jamil et al. 2022; Ullah et al. 2022).

**Table 2: Number and percentage of different identified ticks**

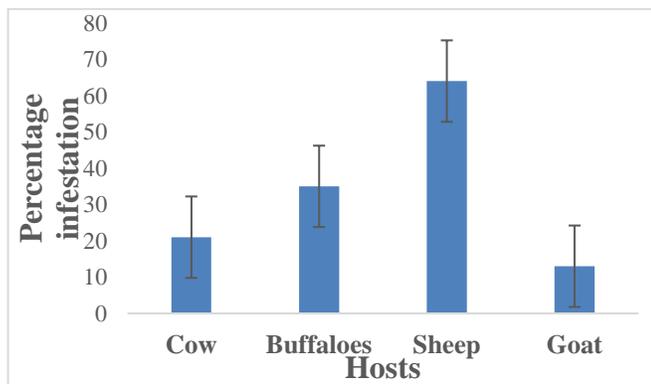
Genera	Number of ticks	Identified percentage (%)
<i>Amblyomma</i>	11	11%
<i>Boophilus</i>	2	2%
<i>Dermacentor</i>	7	7%
<i>Haemaphysalis</i>	15	15%
<i>Hyalomma</i>	34	34%
<i>Ixodes</i>	5	5%
<i>Rhipicephalus</i>	26	26%
Total	100	100%

**Table 3: Sex wise tick infestation on domestic animals in the study area**

Tick genus	Sex		Total
	Male	Female	
<i>Amblyomma</i>	4.00	7.00	11.00
<i>Boophilus</i>	0.00	2.00	2.00
<i>Dermacentor</i>	2.00	5.00	7.00
<i>Hyalomma</i>	12.00	22.00	34.00
<i>Ixodes</i>	2.00	3.00	5.00
<i>Haemaphysalis</i>	6.00	9.00	15.00
<i>Rhipicephalus</i>	12.00	14.00	26.00
Total	38.00	62.00	100

Out of 100 specimens, 7 tick genera were identified using early published or used morphological keys. Ticks genera such as *Ixodes*, *Amblyomma*, *Hyalomma*, *Rhipicephalus*, *Boophilus* and *Dermacentor* were identified during the current study. Similar findings have been reported by many researchers (Ramzan et al. 2020).

They reported 7 tick species such as *D. marginatus*, *Hy. excavatum*, *Hy. anatolicum*, *Hy. dromedarii*, *R. microplus*, *R. singuanius* and *Hae. Punctata*. Ticks are distributed in all regions of Pakistan especially in Province Punjab and Balochistan. Both provinces are famous for livestock rearing and exchange the animals with each other in the form of trade (Ramzan et al. 2018).

**Figure 1: Percentage infestation of ticks on different animals**

Tick infestation was found high in sheep as compared to other examined or screened animals as described in the previous studies. In the current study highest tick infestation was observed in buffaloes followed by cows, sheep and goats. The early researchers (Ali et al. 2013; Chhillar et al. 2014; Ganjali et al. 2014; Sultana et al. 2015; Rehman et al. 2017) had reported the similar findings as the present study observed.

**CONFLICT OF INTEREST**

Authors declare no conflict of interest.

**ACKNOWLEDGEMENT**

Authors are highly thankful to the herdsman for their permission to visit the animal's farms and examine the ticks from their livestock.

**AUTHOR CONTRIBUTIONS**

Najeeb Ullah wrote the manuscript and all other authors critically review the paper.

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**REFERENCES**

- Abebe R, Fantahun T, Abera M, Bekele J, 2010. Survey of ticks (Acari: Ixodidae) infesting cattle in two districts of Somali Regional State, Ethiopia. *Vet World* 3(12): 539.
- Adams E, Woldemariam T, Pal M, Dasgupta R, 2015. Prevalence of major ixodid ticks of cattle in and around Bahir Dar, Ethiopia. *J Nat Hist* 11(1): 32–40.
- Ali Z, Maqbool A, Muhammad K, Khan M, Younis M, 2013. Prevalence of *Theileria annulata* infected hard ticks of cattle and buffalo in Punjab, Pakistan. *DNA* 862: 846.
- Apanaskevich DA, Chaloephanetphong A, Vongphayloth K, Ahantarig A, Apanaskevich MA, Brey PT, Hertz JC, Lakeomany K, Sutherland IW, Trinachartvanit W, 2019. Description of a new species of *Dermacentor* Koch, 1844 (Acari: Ixodidae) from Laos and Thailand. *Syst Parasitol* 96(6): 475-84.
- Chhillar S, Chhillar JS, Kaur H, 2014. Investigations on some hard ticks (Acari: Ixodidae) infesting domestic buffalo and cattle from Haryana, India. *J Entomol Zool Stud* 2(4): 99-104.
- Collatz J, Selzer P, Fuhrmann A, Oehme RM, Mackenstedt U, Kahl O, Steidle JL, 2011. A hidden beneficial: biology of the tick-wasp *Ixodiphagus hookeri* in Germany. *J Appl Entomol* 135(5): 351-8.
- Dantas-Torres F, Martins TF, Muñoz-Leal S, Onofrio VC and Barros-Battesti DM, 2019. Ticks (Ixodida: Argasidae, Ixodidae) of Brazil: updated species checklist and taxonomic keys. *Ticks tick-borne dis* 10(6): 101252.
- Du CH, Sun Y, Xu RM, Shao Z, 2018. Description of *Haemaphysalis* (Alloceraea) *Kolonini* sp. nov., a new species in subgenus *Alloceraea* Schulze (Ixodidae: Haemaphysalis) in China. *Act Parasitol* 63(4): 678-91.
- Ganjali M, Dabirzadeh M, Sargolzaie M 2014. Species

- diversity and distribution of ticks (Acari: Ixodidae) in Zabol County, eastern Iran. *J arthropod-borne dis* 8(2): 219.
- Ghafar A, McGill D, Stevenson MA, Badar M, Kumbher A, Warriach HM, Gasser RB, Jabbar A, 2020. A participatory investigation of bovine health and production issues in Pakistan. *Front Vet sci* 7: 248.
- Jamil M, Kashif M., Ullah H., Mubeen M., Jelani G., Ullah N., Tariq A., Hussain A., Rasheed M., and Ali M. 2021 Identification of tick species infesting livestock in DIKhan, Pakistan. *Systematic & Applied Acarology* 26(12):2247-2252.
- Jamil M., Khan A., Zeeshan M., Hasan S., Rehman A., Noman M., Tariq A., Ullah N., Rasheed M., Ali M., Hussain A., Haq M, Ullah M. 2021 Collection and Identification of Tick Species on Goats and Sheep in Dera Ismail Khan, Pakistan. *Annals of R.S.C.B.25* (6), 18389 – 18394.
- Jamil M, Khan S, Kashif M, Maha Abdulla Alwaili MA, Qahtani WSA, Alshaya DS, Javed M, Muhammad M, Ali M and Rasheed M 2022.Tick collection and infestation on buffaloes at Dera Ismail Khan, KPK, Pakistan. *BIOSCIENCE RESEARCH*,19(1):665-670.
- Jamil, M., Bhatti, A.B., Zia, R., Shabana, K., Kashif, M., Ullah, N., Ali, M., Jabeen, N., Bilal, M., Amin, A., Khan, I., Rasheed, M. 2022. Collection, prevalence and identifying hard tick species among small ruminants in Southern Khyber Pakhtunkhwa, Pakistan. *Bioscience Research*, 19(2): 893-898.
- Jamil, M., Idrees, A., Qadir, Z. A., Elahi, M. E., Imran, F., Qasim, M., Khan, M.S., Aziz, H., I, zafar., qazi, I, Sadia, B., Khan, I., Shah, S.H., & Rashid, M., Ali, M. 2022. Medical and Veterinary Ectoparasites' Importance: An Insight on Alternative Control. *Pakistan Journal of medical and health sciences*.16 (01): 667.
- Jabbar A, Abbas T, Saddiqi HA, Qamar MF, Gasser RB, 2015. Tick-borne diseases of bovines in Pakistan: major scope for future research and improved control. *Parasit vect* 8(1): 1-3.
- Kabir MH, Mondal MM, Eliyas M, Mannan MA, Hashem MA, Debnath NC, Miazi OF, Kashem MA, Islam MR, Elahi MF, 2011. An epidemiological survey on investigation of tick infestation in cattle at Chittagong District, Bangladesh. *Afr J Microbiol Res* 5(4): 346-52.
- Kwak ML, Madden C, Wicker L, 2018. *Ixodes heathi* n. sp.(Acari: Ixodidae), a co-endangered tick from the critically endangered mountain pygmy possum (*Burramys parvus*), with notes on its biology and conservation. *Exp App Acarol* 76(3): 413-9.
- Marcelino I, De Almeida AM, Ventosa M, Pruneau L, Meyer DF, Martinez D, Lefrançois T, Vachiéry N, Coelho AV, 2012. Tick-borne diseases in cattle: applications of proteomics to develop new generation vaccines. *J proteom* 75(14): 4232-50.
- Moges N, Bogale B, Fentahun T, 2012. Hard ticks (Ixodidae): species composition, seasonal dynamics and body site distribution on cattle in Chilga District, Northwest Ethiopia. *Asian J Agric Sci* 4(5): 341-5.
- Ramzan M, Murtaza G, Sattar A, Munawar N, Ullah A, Ejaz A, Ayaz F, Anwar S, Jameel K, Kamran F, 2021. Techniques for managing ticks and tick-borne diseases under changing climate; A review. *Egypt Acad J Biol Sci B Zool* 13(1): 117-28.
- Ramzan M, Naeem-Ullah U, Saba S, Iqbal N, Saeed S, 2020. Prevalence and identification of tick species (Ixodidae) on domestic animals in district Multan, Punjab Pakistan. *Int J Acarol* 46(2): 83-7.
- Ramzan M, Unsar NU, Syed HM, Ghulam M, Alamgir AK, 2018. Knowledge, attitude and practices of herdsmen about ticks and tick-borne diseases in district Multan. *Pak Entomol* 40(1): 13-8.
- Rahman A, Kashif M, Nasir A, et al. 2022. A Review of Tick and Tick Control Strategies in Pakistan. *Pakistan journal of medical and health sciences* 16(01): 652-655.
- Rehman A, Nijhof AM, Sauter-Louis C, Schauer B, Staubach C, Conraths FJ, 2017. Distribution of ticks infesting ruminants and risk factors associated with high tick prevalence in livestock farms in the semi-arid and arid agro-ecological zones of Pakistan. *Parasit vec* 10(1): 1-5.
- Riabi H, Atarodi A, 2014. Faunistic study of hard ticks (Ixodidae) of domestic ruminants in the Southern Khorasan-e-Razavi in comparing with other regions of the province in 2012 Iran. *J Vet Adv* 4(5): 508-15.
- Sultana N, Shamim A, Awan M, Ali U, Hassan M, Siddique R, 2015. First pilot study on the prevalence of tick infestation in livestock of Tehsil Hajira, Rawalakot, Azad Kashmir. *Adv Anim Vet Sci* 3: 430.
- Sun Y, Xu R, Liu Z, Wu M, Qin T, 2019. *Ornithodoros (Ornithodoros) huajianensis* sp. nov.(Acari: argasidae), a new tick species from the Mongolian marmot (*Marmota bobak sibirica*), Gansu province in China. *Int J Parasitol: Parasit Wildlife* 9: 209-17.
- Ullah N, Jamil M, Ramzan M, Arshad A, ul Haq MZ, 2022. Identification and new record of tick species on livestock from district Dera Ismail Khan, Pakistan. *Persian J Acarol* 11(1): 159-62.