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Identification of the prevalent ticks (*Ixodid*) in goats and sheep in Peshawar, Pakistan

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Abstract
A study for investigation hard tick (Ixodid) infestation was carried out in the North-West region of Pakistan during summer 2011. Identification was confirmed in the Veterinary Research Institute (VRI) labs, Peshawar. Effects like age, status of body condition, housing and grazing system, post treatment effects of the acaricides were recorded. During the study of ectoparasites ticks have been recognized as main threat due to severe irritation, allergy and toxicosis, and diseases like bebesiosis, theileriosis and anaplasmosis etc. Out of 170 domestic animals, 95 goats, *Bos taurus* (Bojanus), 75 sheeps, *Bubalus bubalis* (Linnaeus), were studied for the parasite infestation. It was noticed that 5 genera of tick for infestation which were (i) *Haemaphysalis (*Koch) (27.40%) (ii) *Rhipicephalus* (Koch) (21.92%) (iii) *Boophilus* (Curtice) (11.89%) (iv) *Amblyomma* (Koch) (10.02%) (v) *Ixodes (*Latreille) (7.35%). It was concluded that the level of infestation caused by *Haemaphysalis* was maximum while for *Ixodes* it was minimum in goats, compared to sheep where the infestation level was minimum. It is concluded that appropriate control measures for ticks need to be employed in the study area for economical animal production.

Keywords: Black-legged tick, cattle tick, ectoparasite, livestock, Peshawar, Pakistan.

1. Introduction
Ticks were considered parasites of domestic animals as early as 400 B.C. Aristotle in his famous Historia Animalium" stated that the ticks were disgusting parasites and that were generated from grass. Despite this early realization little work was done until the latter half of nineteenth century, when a number of parasitologists all over the world started working on taxonomy, prevalence, and bionomics, seasonal and regional occurrence of the ticks [1].
They belong to phylum, Arthropoda and order, Acarina. They are grouped into three families, Argasidae or soft ticks, Ixodidae or hard ticks and Nuttalliellidae. There are 899 tick species those parasitize the vertebrates including 185 species of Argasidae, 713 species of Ixodidae and one species of Nuttalliellidae [2].
Livestock, the backbone of Pakistan's agricultural economy, is at risk of decline in production due to number of ecto- and endo-parasites. Among ecto-parasites, ticks have been recognized as the notorious threat due to severe irritation, allergy and toxicosis [3]. Ticks are known to transmit diseases like babesiosis, theileriosis, anaplasmosis, etc. [4]. Ticks act not only as potential vectors but also as reservoirs of certain infectious agents, e.g., *Pasteurella multocida*, *Brucella abortus* and *Salmonella typhimurium* in man an animal [5]. Ticks have been recognized as important ectoparasites of livestock. They are voracious blood suckers resulting in lowered productivity. Besides this ticks transmit protozoan [6], bacterial [7] and rickettsial [8] diseases to their hosts. Parasitic diseases are the most prevalent in the province of Khyber Pakhtunkhwa (KP), causing huge losses of livestock wealth. Only ecto and endoparasites cause 40% production losses to our herds [9]. Ectoparasites especially ticks play a major role of vector in spread of different diseases of livestock and human beings. Surveillance studies have indicated high prevalence of different ticks in domestic and wild animals in the country [10].
Therefore, the present study was designed to investigate the prevalent ticks (*Ixodidae*) genera in goats and sheep in Peshawar, KP, Pakistan.

2. Materials and methods
Study area
Peshawar is a district in the Khyber Pakhtunkhwa province of Pakistan. The District is

geographically located at latitude 34^0 20' 24" North of the equator and longitude 73^0 12' 0" East of the prime meridian on the map of the world. The city of Peshawar, as well as being the provincial capital. The area of the district is 1,257 km^2, and at the 1998 Pakistan census it had a population of 4, 63500. Peshawar is situated near the eastern end of the Khyber Pass and sits mainly on the Iranian plateau along with the rest of the KP (Figure 1). The climate of the area is semi-arid with very hot summers and mild winters. "Winter" in Peshawar starts in mid November and ends in late March with minimum 4 °C and maximum is 18.35 °C. Summer months are from May to September. The mean maximum temperature in summer is over 40 °C and mean minimum temperature is 25 °C (Ali, 2005).

3. Sample collection and processing

Tick collection

During the present study a total of 170 goats and sheep were examined for tick's infestation in 9 villages of Peshawar, out of which 120 were found positive for infestation and 50 negative. Feeding or engorged ticks of all three stages (larva, nymph, adult) were collected carefully by removing them from the host's body without causing them to be damaged. Especially care was paid to the mouth parts of the tick, which are firmly embedded in the host's skin in case of engorged ticks. For this purpose a useful method was adopted; the ticks being most readily found in the auxiliary and inguinal regions, and on the neck or brisket in cattle, the 'head' being grip firmly, but lightly, by means of forceps, and the tick turned over on to its back and then pulled out sharply, perpendicularly away from the skin. Collected ticks were transferred to suitable capped bottles (Mac Cortney Bottles) containing 70% alcohol as acarine preservatives being properly labeled and shifted to VRI laboratory.

Tick processing

The preserved ticks were processed in the laboratory. The ticks were shifted to potato tubes containing 15% solution of potassium hydroxide (KOH) and were boiled over a spirit lamp for 10-20 minutes depending upon their clearance and then washed with tap water to wash out the excess alkali. Dark or heavily chitinized specimens are usually treated with strong alkaline solutions to bleach them and dissolve their soft organs, muscles and fats therefore, chitinous plates are more clearly seen, and however, as a rule such treatment is unnecessary for juvenile stages such as larvae and nymphs.

In order to dehydrate the ticks, they were passed through a series of different grades (aqueous solutions of ethyl alcohol, i.e., 20, 30, 40, 50, 60, 70, 80, 90, and 95%) allowing for two hours in each grade. After getting passed through the last series of the aqueous solution of alcohol, i.e., 95%, the ticks were then put under tap water to wash the excess alcohol. The ticks were then transferred to a container containing aniline oil allowing for 24-48 hours to be cleared. Aniline oil is perhaps the better clearing agent for arthropods, because of its tolerance of water and less tendency to collapse the specimens than any other agent. Clearing is not complete until specimens sink to the bottom and are perfectly transparent. Draw off the clearing agent and wash the specimens with two changes of xylol, the first may become milky but the second should remain clear. It is used mostly to study external characteristics; for this purpose care must be exercised in collecting and handling the materials to prevent breaking of legs and mouthparts etc. After getting the tick cleared in aniline oil, enough Canada balsam over tick on a glass slide were put applying a cover slip and kept in an oven under sufficient time and temperature combination for the purpose of dehydration. Delicate and large specimens that need to be posed are best handled in manner where by a section lifter is dipped in the xylol containing the specimens, which is then floated on to the blade. The lifter is then carefully removed with the specimens on it. A needle may be used to keep it from floating off as the blade is lifted from the xylol. Place the blade against a clean slide and wash the specimens onto it with a little xylol in a medicine dropper. Quickly tips the slide to drain-off the excess xylol and if posing is to be done quickly arrange the parts as desired using needle under dissecting microscope. The ticks were then subjected to taxonomical identification process under stereomicroscope using proper keys Hoskin (1991).

4. Results

During the present survey, 170 animals (goats and sheep) were examined, in which 120 animals (goats and sheep) were found infested by different types of ticks. Among which 70 goats and 50 sheep were infested, while 25 goats and 25 sheep were non-infested (Figure 1).

During the present research 5 genera of different types of ticks were identified which are *Amblyomma*, *Boophilus*, *Haemaphysalis*, *Ixodes* and *Rhipicephalus* (Figure 2).

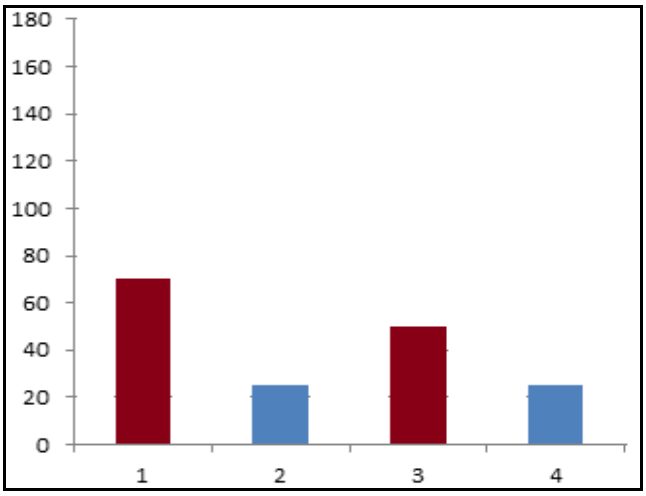

Fig 1: Total number of infested and non-infested goats and sheep during the present research from March-July 2011 (n=170); infested: ; non-infested:

a b

c d

e

Fig 2: Species belonging to identified genera during the present research from March-July 2011. a: *Amblyoma;* b*: Boophilus;* c: *Haemophysalis;* d: *Ixodes*; e: *Rhipicephalus*.

During the present research total 220 ticks were collected from goats and sheep in which 50 were unidentified. High infestation was cause by *Haemophysalis* (22.72%), followed by *Rhipicephalus* (18.18%), *Boophilus* (15%), *Amblyoma* (13.18%) and *Ixodes* (8.18%) (Table 1).

Table 1: Number and percentage of different ticks genera identified

S. No.	Genera	No. of ticks	Identified % %*
1.	*Amblyoma*	29	*13.18*
2.	*Boophilus*	33	*15.00*
3.	*Haemophysalis*	50	*22.72*
4.	*Ixodes*	18	*8.18*
5.	*Rhipicephalus*	40	*18.18*
Unidentified ticks		50	*22.72*
Total		220	*100.00*

During the present study total 170 animals (goats and sheep) were observed, in which 120 (70.58%) were infested and 50 (29.41%) were none infested. Out of total 70 (73.68%) goats, 50 (66.66%) sheep were infested and 25 (26.31%) goats and 25 (33.33%) sheep were non infested (Table 2).

Table 2: Total infested and non infested animals observed

Animal Species		Infested*		Non infested*	
	N		%		%
Sheep	75	50	66.66	25	33.33
Goats	95	70	73.68	25	26.31
Total	170	120		50	

During the present study, the samples were collected from goats and sheep, in which 70 goats and 50 sheep were infested. In 7 (7.36%) goats and 5 (6.66%) sheep *Ixodes* were found. *Boophilus* were observed in 10 (10.52%) goats and 9 (12.0%) sheep. *Rhipicephalus* were observed in 17 (17.89%) goats and 13 (17.33%) sheep. *Hemophysalis* were identified in 23 (24.21%) goats and 17 (22.66%) sheep. *Amblyoma* were noticed in 13 (13.66%) goats and 6 (8.0%) sheep (Table 3).

Table 3: Comparative study of infestation with ticks in different animals, goats and sheep.

S. No	Genera	Sheep*	(%)*	Goat*	(%)*
1.	*Amblyoma*	6	8.0	13	13.68
2.	*Boophilus*	9	12.0	10	10.52
3.	*Hemophysalis*	17	22.66	23	24.21
4.	*Ixodes*	5	6.66	7	7.36
5.	*Rhipicephalus*	13	17.33	17	17.89
Noninfested Animal		25	33.33	25	26.31
Total		75	100.0	95	100.0

Infestation was also noticed in young and adult of goats. About 35 young and 60 adults of goats were observed. The *Ixodes* were found in 4 young, 7 adults of goats. *Boophilus* were observed in 3 young, 8 adults of goats. In 4 young, 12 adults of goats *Rhipicephalus* were noticed. The *Haemaphysalis* were found in 8 young, 14 adults of goats. In 3 young, 7 adults of goats *Amblyoma* were noticed (Table 4).

Table 4: infested goats based on age factor

Goats*					
S. No	Genera	Young	%	Adult	%
1	*Amblyomma*	3	3.15	7	7.36
2	*Boophilus*	3	3.15	8	8.42
3	*Haemaphysalis*	8	8.42	14	14.73
4	*Ixodes*	4	4.21	7	7.36
5	*Rhipicephalus*	4	4.21	12	12.63
Non infested Goats		13	13.68	12	12.63
Total		35	36.84	60	63.15

The infestation was found in 30 in young and 45 adults of sheep. The *Ixodes* were found in 1 young, 5 adults of sheep, *Boophilus* were observed in 3 young, 6 adults of sheep. In 5 young, 7 adults of sheep *Rhipicephalus* were noticed. The *Hempophysalis* were found in 6 young, 9 adults of sheep. In 2 young, 6 adults of sheep *Amblyoma* were noticed (Table 5).

Table 5: Infested sheep based on age factor

Sheep*					
S. No	Genera	Young	%	Adult	%
1	*Amblyoma*	2	2.66	6	8.0
2	*Boophilus*	3	4.0	6	8.0
3	*Haemaphysalis*	6	8.0	9	12.0
4	*Ixodes*	1	1.33	5	6.66
5	*Rhipicephalus*	5	6.66	7	9.33
Non infested Sheep		13	17.33	12	16.0
Total		30	40.0	45	60.0

*Numbers and % in the columns shows number of young and adult of sheep

5. Discussion

A reported prevalence (15%) of *Hyalomma* tick followed by *Boophilus* (12%), *Haemaphysalis* (5%) and *Rhipicephalus* (3%) in district Kasur, Pakistan [11]. Three genera were same in both study which are, *Boophilus*, *Haemaphysalis* and *Rhipicephalus*. Two genera *Amblyoma*, and *Ixodes* were not reported in the study of due to different area in which the studies were conducted [11].

During 2008, (12%) prevalence of *Hyalomma* ticks was observed followed by *Boophilus* (8.1%), *Haemaphysalis* (5%) and *Rhipicephalus* (3.5%). In present study genera were noticed. Among which the highest infestation was caused by *Hemophysalis* (22.72%), followed by *Rhipicephalus* (18.18%), *Boophilus* (15.00%), *Amblyoma* (13.18%) and *Ixodes* (8.18%). In both studies three genera, *Boophilus*, *Haemaphysalis* and *Rhipicephalus* are same and two genera of present survey were not observed in study due different climatic conditions [11]. In present study five genera *Ixodes*, *Boophilus*, *Rhipicephalus*, *Hemophysalis*, and *Amblyoma* were reported.

Ali (1988) studied the poultry in northern areas of Pakistan [12]. The genera recorded were *Hyalomma*, *Boophilus* and *Hypoderma* in cattle. In present survey five genera were noticed which were *Ixodes*, *Boophilus*, *Rhipicephalus*, *Hemophysalis*, and *Amblyoma*. In both study one genera *Boophilus* were same. *Ixodes*, *Rhipicephalus*, *Hemophysalis* and *Amblyoma* of the present study were not found in the study and two genera of Ali's study were not noticed in the present survey due to different region in which the studies were conducted [13].

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