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Tick Infestation Rate in Cattle and Buffalo in Different Areas of Khyber Pakhtunkhwa, Pakistan

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ABSTRACT

Ectoparasites have a major impact on the production and health status of livestock. An active surveillance study was conducted to estimate the tick infestation rate and its geographical distribution in relation to climate change along altitudinal gradients in Khyber Pakhtunkhwa, Pakistan. The study was conducted in the form of two clusters of climate; hot arid area at an average of 500m and cold hilly area at an altitude of 1110m above the sea level. Total of 1223 (48.35%) cattle and 1306 (51.65%) buffaloes were examined in the study at different altitudes in the same season and tick infestation rate was observed. The results showed that in the hot arid area, the tick's infestation level was higher at the lower altitudes. Cumulative ticks infestation rate was found significantly higher (34.79%) in hot arid plane area than that of (18.63%) in cold hilly area (p>0.05). The tick overall infestation rate in cattle (33.36%) was significantly higher than that of buffaloes (22.58%). This approach will help in defining recommendations for the future research priorities that will help in designing policies aimed at spatially integrated major gears of the biological cycles of tick borne diseases.

Key words: Ectoparasites, Tick, Climate change, Impact, Cattle, Buffalo.

INTRODUCTION

Arthropods and insects probably have evolved about 600 million years ago and 300 million years earlier than the Warm blooded vertebrates. In recent decades, parasitism has remained one of the major problems of dairy industry in Pakistan. In this context, the most common tick species prevailing are Hyalomma, Boophilus, Haemaphysalis and Rhipicephalus (Durrani and Shakoori. 2009). It has been proposed, that climate change affects the distribution and prevalence of vector borne diseases (Wilson, 2009). Kirby et al., (2004) reported that these infectious diseases may be predominantly susceptible to the climate change because of their arthropod vectors sensitivity to the variation in climatic conditions. Transmission of infections as described by many theories occurs when an overlap of several activities between vector, reservoir and victims takes place, and vary with respect to the pathogens and their location. Change in climatic conditions may have great impact on all these stages as well as their interactions. Furthermore, change in the climate and length of different seasons will affect directly the tick survival, development and activity. However, there is not enough evidence that rise in temperatures results into a greater profusion of ticks (Gray, 2008). Even though comparatively few in number, through the direct and indirect impact on their hosts, some various species of arthropod (ectoparasites) do have a major impact on husbandry, its productivity and the welfare of livestock (Rehbein et al., 2003). Rajput et al., (2006) discussed that ticks also transmit some viral, protozoan and bacterial pathogens causing diseases like hemorrhagic fever, anaplasmosis, theileriosis, ehrlichiosis, and babesiosis in dairy and meat animals. The ticks suck host blood throughout their lengthy attachment phase of 7-14 days, which may be extended depending on the tick species and unique host association (Hakim et al., 2007). Optimal temperature and relative humidity required for growth and the reproduction of ticks is 26-37^{o}C and 85%, respectively (Aktas et al., 2004; Yakhachali and Hosseine, 2006). Jouda et al., (2004) mentioned that tick prevalence was higher in fall season compared to the least observed in summer and spring. Variations in the phenology of ticks occur from year to year at same location. The objective of the present study was to evaluate tick infestation rate (TIR) in cattle and buffaloes, their distribution and the impact of climate change on the tick population at varying altitudes in two different climatic clusters in Khyber Pakhtunkhwa (KPK), Pakistan.

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MATERIALS AND METHODS

Study Area

Two stage sampling was done in the study. At first stage, eight districts were randomly selected out of a total of 26 districts of KPK and 7 of Federally Administered Tribal Areas (FATA). At second stage, one village was randomly selected per district out of total villages. Total livestock population was 1223 (48.35%) of cattle and

1306 (51.65%) of buffaloes (local, exotic and cross bred). Cattle in these rural villages were mostly exotic and cross bred whereas low ratio of local native breeds was also present. Buffalo breeds found were mostly Nili Ravi and Azakheli (local). Animals of all ages and sexes were included in the study.

Collection of Data

Data was collected on a structured questionnaire from July 2013 to Sep 2013. The questionnaire had questions having all the information relating to the demography of the livestock species kept by farmers, social context and tick infestation status. Animals having >5 ticks and above were considered as tick infested animal. Briefly, two clusters were made, where each cluster consisted of four villages, and each village was from a single district. The hot arid cluster consisted of district Peshawar, Buner, Nowshera and Khyber Agency while Cold hilly cluster consisted of district Shangla, Swat, Abbottabad and district Malakand of KPK.

Statistical Analysis

The data obtained through questionnaire for prevalence of tick infestation and its influencing factors were analyzed using SPSS (version 16.0). Chi square test (at 95% confidence interval) was used to find the association between these categorical variables.

RESULTS AND DISCUSSION

This study was carried out in Shangla, Swat, Abbottabad, Malakand, Peshawar, Buner and Nowshera districts and in one rural village from Khyber Agency, FATA. The results showed that the TIR was higher in cattle compared to buffalo population. The overall TIR was 27.79% in both clusters. In hot arid plane area districts, the average TIR was significantly higher (34.79%) than that of high altitude cold area (18.63%) ($p>0.05$). TIR in both areas as a whole was significantly ($p>0.05$) higher in cattle (33.36%) than in buffalo (22.58%) population. In each district at lower as well as higher altitude, TIR was higher in cattle than in buffalo population. TIR in the hilly area at higher altitude was still higher in cattle (20.40%) than in buffaloes (17.23%). Similar tick infestation status was found in hot arid areas where TIR in cattle (41.72%) was significantly higher from buffaloes (27.35%). TIR in these areas was higher due to the favourable climatic conditions (humidity and temperature). This was particularly in the hotter months of year i.e. from April-August. District wise TIR was also calculated in both species and compared (Table 1).

Parasitism especially of tick infestation is a frequent problem of livestock in Pakistan. The analysis of the data showed that TIR was significantly higher in cattle than in buffalo population (Figure 2). The results showed the overall TIR of 27.79%. TIR recorded in cattle was 33.36% that was significantly higher than 18.63% in buffalo population. Where as in hot arid plane area TIR in cattle was 41.72% and in cold hilly areas it was 20.40% (Figure 1). A higher TIR in cattle population was probably because most of the cattle breeds kept in this area were cross bred or exotic in nature. These findings were in agreement with Fesharki, (1988), who also reported susceptibility of these breeds to tick infestation. It may also be due to the tick species prevailing that may be different or the climate of the present study area does not have suited them to survive as well as they do in the other hotter regions. Our findings are in agreement with the observations of Manan et al., (2007), but do not agree with (Durrani and Shakoori, 2009; Rehman et al., 2004) The variation in the prevalence of the TIR reported by the present study and of literature reviewed, indicates that the specific specie might have developed susceptibility for the ticks. The results of our study were different from that of Sajid et al., (2008) who reported a higher rate of TIR in cattle.

After the analysis of the results it looks likely that with an increase in humidity and temperature in future, ticks activity will happen more in autumn and the months of winter in many parts of this region. Additionally, a better proportion of tick population at the same time might be found active as compared to present, resulting in temporal change in risk of the tick borne diseases. If we consider the previous study conducted by Khan et al., (1996), who reported TIR of 28.2% in cattle and 14.7% in buffaloes in district Faisalabad, Pakistan; this showed a 100% increase in the tick prevalence in Punjab over the last couple of decades. In some parts of the world, there is a possibility to relate the disease incidence to climate change, and also a positive association of incidence with mild warm, humid summer and winter (Bennet et al., 2006).

Difference in TIR in different places of the country could not be solely associated with the climate change, but it can be due to the susceptibility of the breeds kept by farmers in these days. The selection of more productive breeds, combined with intensified production and the traditional husbandry practices rather than modern techniques, has resulted into an increased susceptibility to parasites (Stevens et al., 2006). Moreover, the microclimatic variables like relative humidity and soil surface temperature (affected by slope, snow cover, litter layer, vegetation, underlying soils and humus) might be decisive in determining pattern and distribution of the specific niches for the tick survival within an area.

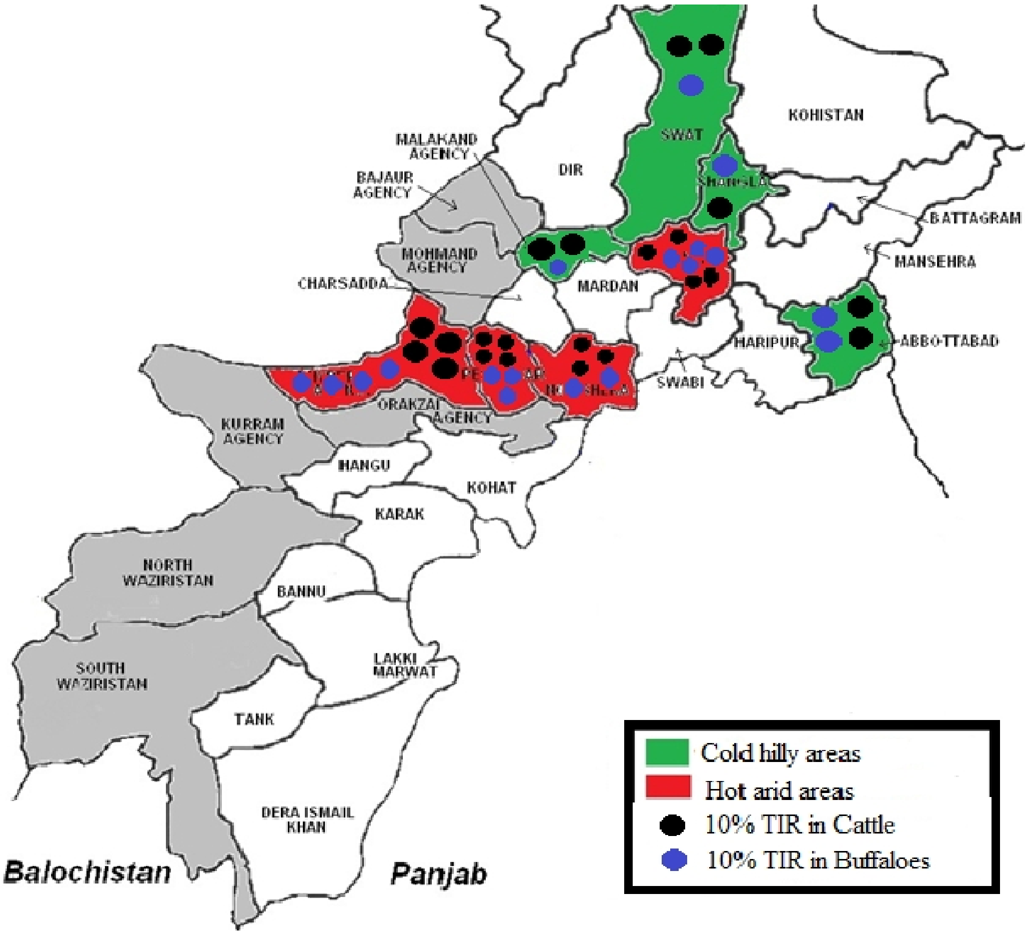

Figure 1 Spatial distribution of tick infestation rate in the study area

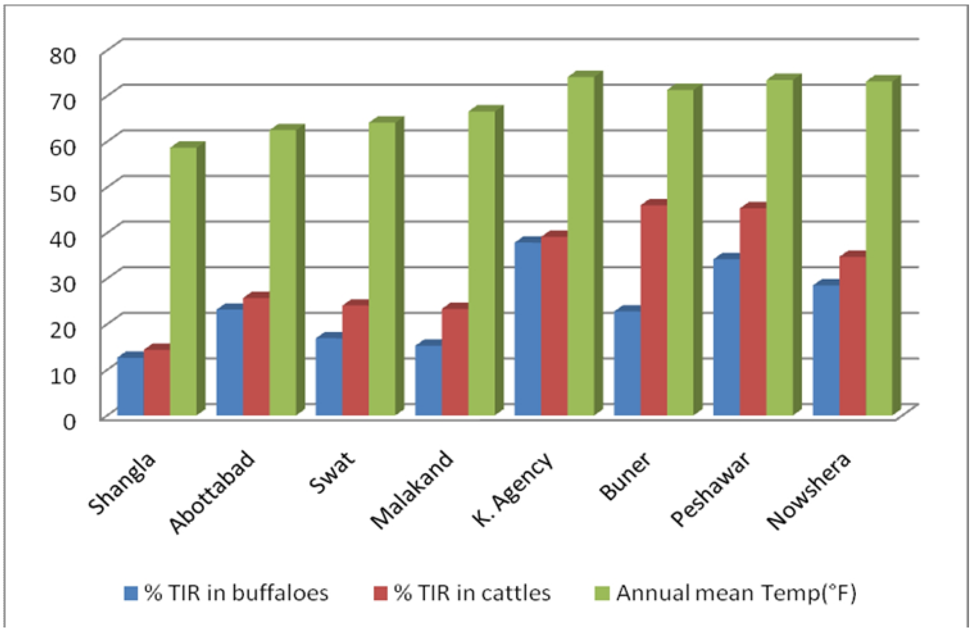

Figure 2 TIR with respect to temperature variation in cattles and buffaloes in different districts of Khyber Pakhtunkhwa

Table 1 Tick infestation rate in different climatic clusters in Khyber Pakhtunkhwa

Parameters	Variables	Level	%TIR (n/N)**	P-value*
Climatic region	Cumulative TIR	CCC[1]	18.63 (204/1095)	0.0001
		HCC[2]	34.79 (499/1434)	
Host specie	Cattle/Buffalo	Cattle	33.36 (408/1223)	0.0002
		Buffalo	22.58 (295/1306)	
Age	Cattle	Young Cattle	33.60 (163/485)	0.0973
		Adult Cattle	33.19 (245/738)	
	Buffalo	Young buffalo	25.83 (163/631)	0.0005
		Adult Buffalo	19.55 (132/675)	
Annual mean Temp(F)	CCC	62.98	18.63 (204/1095)	0.0001
	HCC	73.04	34.79 (499/1434)	
Altitudinal variation(ft)	Shangla	4800 ft	13.84 (36/260)	0.0031
	Abottabad	4134 ft	24.15 (64/265)	
	Swat	3228 ft	18.35 (49/267)	
	Malakand	2349 ft	18.81 (57/303)	
	K. Agency	3510 ft	38.72 (86/222)	
	Buner	2260 ft	32.66 (228/698)	
	Peshawar	1178 ft	41.58 (89/214)	
	Nowshera	925 ft	31.33 (94/300)	

[1]Cold climatic cluster, [2]Hot climatic cluster, *at 95% significant level
**n= number of infested animals N= total animals observed.

CONCLUSION

Although it was concluded that changes in the climate and length of the various seasons affect tick development, activity and survival, the magnitude of impact also depends upon the vulnerability of the host, tick biology, ecosystems, biodiversity, birds migrating patterns, land cover changes, behavioural patterns of the host, and the population immunity. While some of the above conditions are influenced by the climate change, the complex nature of factors involved makes it too difficult to determine the precise risks that are responsible for the changes in the diseases incidence. Ixodes ricinus is particularly flexible and adaptable tick which can exhibit different seasonal activity within a geographical array.

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