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PREVALENCE OF TICK INFESTATION IN DIFFERENT BREEDS OF CATTLE IN BALOCHISTAN

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ABSTRACT

Studies were carried on the prevalence of tick infestation in cattle in District Quetta, the Provincial Head Quarter of Balochistan Province. The results of the study revealed that, out of 600 cattle 210(35%) were positive for tick infestation. Among these, adult cattle over 3 years of age showed higher prevalence (82.05%) followed by cattle up to 3 years (75.64%), 2 years (70.51%), 12 months (19.16%), 9 months (5.83%) and less than 6 months of age (1.58%).. Holstein Friesian revealed higher prevalence (59%) than Crossbred (28.5%) and Bhag Nari cattle breed (17.5%). Similarly the uppermost tick infestation (84%) was recorded in summer season while the lowermost (4.66%) was noted in winter. Female animals showed higher (36%) tick infestation than male (32%).The most dominant tick species identified; *Rhipiciphalus (Boophilus) microplus* (35.5%), *Rhipiciphalus (Boophilus) annulatus* (28.5%), *Hyaloma* (26.5%) and *Rhipiciphalus sanguineus* (9.5%).

Keywords: Tick infestation; Cattle; Prevalence; Quetta; Balochistan

INTRODUCTION

Vectors play a key role in the transmission of different viral, rickettsial, bacterial and protozoan diseases. A vector is an arthropod causes no disease itself but is capable of infecting its hosts (Mary *et al*., 2000).Tick helps as vector for protozoan diseases such as *babesiosis*. The importance of tick and tick-borne diseases has been documented by number of researchers throughout the world. Many researchers globally as well as in Pakistan worked on the prevalence of tick infestation, taxonomy and economical losses.Ticks are the most common external parasites causing drop in production, blood loss, helps in the spread of diseases and can be found in both hilly and plain areas (Shemshad *et al*., 2012). It is true that only one infected tick is enough to transmit the disease. Similarly in a vector population a very small number of ticks actually carry the disease such as *B. bovis* as few as 1 in 5000 ticks whereas *B bigemina* 1 in 500 ticks. One tick spits ~0.5 ml of saliva into its host and ingests ~3 ml of blood where as a susceptible bovine can harbor ~1000 female ticks; each lays ~4000 eggs. (Zintl *et al*., 2003). British and European breeds are more susceptible than *Bos-indicus* breeds such as Sahiwal, BhagNari.

In Balochistan, Ticks are considering being the most important problem of cattle and reported in different areas of the province including District Quetta. Topographically Quetta lies between (30^0 - 03'and 30^0-27' North) and (66^0 - 44'and 67^0 - 18' East) with an altitude of 1700 Meters and is generally covered with different mountains i.e. Mashlakh, Chiltan, Murdar and Zarghoon. Generally the climate is dry with cold winter whereas summer ranges (32 to 35ºC) and "July" is considered to be the hottest month of the year. It is situated outside the range of the monsoon with scanty and irregular rainfall region (Balochistan District Database, 1999). Livestock is the key sector while small ruminants are the major source of production. The Livestock and Dairy Development Department Balochistan understands the worth of livestock. In this regards in 1981 about 1000 Friesian cattle were imported from Netherlands and maintained at Government Dairy Farm Quetta for increase in milk production. Similarly in late nineties Balochistan Nari Master (a beef breed) was evolved by crossing Australian Droughtrnaster bull with indigenous Bhagnari cattle at Beef Production Research Center, Sibi (Shafiq and Kakar 2006). District Sibi is the home tract of Bhag Nari cattle. These animals are considered to be pride of the province. In Balochistan, out of total 2.3 million cattle about 1.027 million are Bhag Nari cattle (Livestock census 2006). Other cattle breeds i.e. Jersey, Red Sindhi, Lohani, Sahiwal, Thari, and non-descript while Buffalo breeds i.e. Kundi and Nili Ravi are also found in the area. Due to increase in human population, consumers demands for wholesome, cheapest and palatable food and also smuggling to Afghanistan/Iran and other neighboring countries may create always meat shortage problems (Shafiq and Kakar, 2006) and thus the importance of beef animals become increased. Today large numbers of farmers are engaged in beef

production/bull fattening business to fulfill the market requirements. During the last few decades demand for exotic breeds and crossbreeding program for maximizing the production have increased the interest of farmers. There are 2 million crossbred cattle in Pakistan (Khan 1994) out of which about 150,000 heads of crossbred cattle are breathing in Balochistan (Kakar *et a.,l* 2008)

Keeping in view the value of ticks in Balochistan, the present study was designed to evaluate the prevalence of tick infestation in cattle and to identify the most common tick species surviving in the province. We are confident that the results of this study would be helpful and can be utilized as the base line information for further studies/projects related to tick and tick-borne disease.

MATERIALS AND METHODS

Study area: The present study was carried out in District Quetta, the provincial head quarter of Balochistan province.

Selection of animals: Total 600 cattle, 200 Bhag Nari, 200 Holstein Friesian, and 200 Cross bred were selected randomly for breed, age, sex and seasonal study factors. The animals were distributed into two major groups i.e. Young animals up to 12 months and adult animals over 12 months of age. The animals were further distributed into sub-groups i.e. Young animals (less than 6 months, 9 months and 12 months) while Adult animals (up to 2 years, 3 years and above 3 years of age).

The Prevalence of vector: The Prevalence of tick infestation in District Quetta was calculated according to formula presented by Thursfield (2005):

$$\text{Prevalence} = \frac{\text{Number of animals found positive}}{\text{Total Number of animals sampled}} \times 100$$

Severity of tick infestation: To evaluate the density of tick**,** the whole body of selected animals was examined for tick infestation and scored as described by Pusterla *et al*.(1998) i.e. mild (<10 ticks/animal), moderate (10 to 30 ticks/animal), or severe (>30 ticks/animal). The animals found positive for tick infestation were separated and tagged for further examination.

Tick collection: The wholebody of the animals were checked properly for the presence of vectors and removed/collected carefully (prior to dipping of animals) in clean tubes covered with cotton wool. For this purpose forceps method was used as described by Walker *et al*. (2003) by gripping the capitulum firmly with the help of a steel forceps and turned the vector over on its back and then pulled out. The precautionary measures were followed as described by Soulsby (1982), Teglas *et al*. (2005) and Zafar *et al*. (2006) to avoid damages to vector body parts.

Preservation and storage of samples: All the specimens were properly labeled and preserved in 70% formalin with 5% glycerol. Provincial Disease Investigation laboratory, Quetta was primarily used for the storage of samples which were then transferred to the Laboratory of Department of Clinical Medicine and Surgery, University of Veterinary and Animal Sciences, Lahore, following the standard laboratory precautions for further process.

Identification of tick specimen: During the study 200 tick specimens were randomly collectedto find out the most prevalent tick species with predilection sites. The tick specimen were processed for permanent mounting over clean microscope slides and stained by Acid Fuchsine Method. The Identification of vectors was made with the help of Pictorial Key as describe by Keirans and Litwak (1989), Jongejan and Uilenberg (1994), Bock *et al*. (2006) and Walker *et al*. (2007)**.** The difference between hard and soft ticks was kept in mind as mentioned by Urquhart *et al*. (1996) and Kakarsulemankhel (2010).

Statistical analysis: The data collected during the course of study was subjected to statistical analysis. For this purpose, computer software program "SPSS version" 16 were used and calculated the results of data by applying chi square test.

RESULTS

Age wise prevalence of tick infestation: Out of 600 cattle, 210 animals were found positive for tick infestation. The overall prevalence (35%) was recorded during the study. Among these adult cattle over 3 years of age showed higher prevalence of tick infestation followed by animals up to 3 years, 2 years, 12 months, 9 months and less than 6 months of age respectively (Table 1). The statistical analysis showed significant difference ($P<0.05$) in prevalence of tick infestation in different age groups of cattle.

Breed wise prevalence of tick infestation: Higher prevalence of tick infestation was noted in Holstein Friesian cattle (59%) followed by Crossbred cattle (28.5%) while the lowest prevalence of tick infestation was recorded in Bhag Nari cattle breed (17.5%) (Table 2). The statistical analysis showed significantdifference ($P<0.05$) in prevalence of tick infestation in different breeds of cattle.

Sex wise prevalence of tick infestation: In District Quetta the higher prevalence of tick infestation (36%) was recorded in female than male (32%) (Table 3).The difference of prevalence of tick infestation in either sex groups was not statistically significant ($P<0.05$).

Season wise prevalence of tick infestation: The appearance of ticks on animal body was noted in March

in summer season and increased the numbers till the end of August. Similarly the population of ticks was also recorded during the months of September and October but decreased in November. However the highest tick population was recorded during the months of June and July but no tick population was noted during the months of December, January and February. The results of tick infestation revealed higher tick infestation (84%) in summer season while the lowermost infestation (4.66%) was recorded during winter season (Table 4). The statistical analysis showed highly significantdifference (P<0.05) of prevalence of tick infestation during different seasons of the year.

Prevalence of most dominant tick species and predilection sites: The result of the study revealed the most dominant tick species; *Rhipiciphalus (Boophilus) microplus* (35.5%) with predilection sites; dewlap, shoulder area, external genitalia and udder region followed by *Rhipiciphalus (Boophilus) annulatus* (28.5%) with predilection sites; dewlap, legs particularly hind legs, abdominal area and in some cases head regions particularly neck. Similarly *Hyaloma spp.* (26.5%) was noted with predilection sites; external genitalia, udder and perineum while *Rhipiciphalus sanguineus* was noted (9.5%) with predilection sites; ear, shoulder and neck (Table 5).

Table 1. Age wise prevalence of tick infestation.

Group of animals	Sub-group of animals	No. of cattle examined for tick infestation	No of cattle positive for tick infestation	Prevalence %	P value
Young animals less than 12 months	Less than 6 months	126	2	1.58	0.00001*
	Up to 9 months	120	7	5.83	
	Up to 12 months	120	23	19.16	
Adult group of animals Over 12 months	Up to 2 years	78	55	70.51	
	Up to 3 years	78	59	75.64	
	Over 3 years	78	64	82.05	

*Statistical analysis. Significant difference (P<0.05) in prevalence of tick infestation in different age groups of cattle.

Table 2. Breed wise prevalence of tick infestation.

Breeds	No. of cattle examined for tick infestation	No of cattle positive for tick infestation	Prevalence %	P value
BhagNari	200	35	17.5	0.00001*
Holstein Friesian	200	118	59	
Crossbred	200	57	28.5	

*Statistical analysis. Significant difference (P<0.05) in prevalence of tick infestation in different breeds of cattle.

Table 3. Sex wise prevalence of tick infestation

Sex	No. of cattle examined for tick infestation	No. of cattle positive for tick infestation	Prevalence %	P value
Male	150	48	32	0.3737
Female	450	162	36	

P value. The difference of prevalence of tick infestation in either sex groups was not statistically significant (P<0.05)

Table4. Season wise prevalence of tick infestation.

Seasons	No. of cattle examined for tick infestation	No. of cattle positive for tick infestation	Prevalence %	P value
Spring	150	54	36	0.00001*
Summer	150	126	84	
Autumn	150	23	15.33	
Winter	150	7	4.66	

*Statistical analysis. Highly significantdifference (P<0.05) of prevalence of tick infestation during different seasons of the year.

Table 5. Prevalence of most dominant tick species with predilection sites identified in District Quetta.

Ticks species identified in the area	No. of ticks species identified in the area	Prevalence %	Predilection sites of ticks noted
Rhipiciphalus (Boophilus) microplus	71	35.5	Dewlap, shoulder area, external genitalia and udder region.
Rhipiciphalus (Boophilus) annulatus	57	28.5	Dewlap, legs particularly hind legs, abdominal area and in some cases head regions particularly neck.
Hyaloma spp.	53	26.5	External genitalia, udder and perineum.
Rhipiciphalussanguineus	19	9.5	Ear, shoulder and neck.

DISCUSSION

Tick infestation is a common problem of farm animals in Pakistan. Many researchers worked successfully on prevalence of tick infestation but District Quetta is not studied about this aspect. This is the first effort to conduct study in the area. The results of this study showed the overall prevalence of tick infestation (35%). A higher tick infestation in was perhaps because most of the tick populations were found on exotic and/or crossbred cattle. Almost all researchers believe that European cattle are more susceptible to tick infestation than indigenous breeds. Generally it is considered that tick infestation rate is higher in hot and humid areas but in present study the result revealed higher prevalence in District Quetta which is dry, cold and high altitude area. These findings are in agreement with Khan *et al* (2013) who recorded higher tick infestation rate in cattle (20.47%). The results are also in accordance with the findings of Kabir *et al*. (2011) who reported that the cattle maintained at hilly areas are 1.84 times more susceptible to tick infestation as compare to cattle reared in plain areas. They observed higher tick infestation (44.44%) in cattle of hilly areas followed by (30.27%) in plain areas. Hypothetically, MacLeod (1970) described the reason of this difference might be due to the presence of different herbs, shrubs and grasses that provides good shelter to ticks eggs for hatching process. Similarly Kamal (1996) mentioned that this difference may be due to shortage of water in hilly area, hence regular bath and rubbing practices are rarely practiced in hilly areas. The conclusion is in accordance with the statement of Bock *et al*. (2006) that dipping practices may helpful to control protozoan infection for months or years. Investigations have revealed that maternally derived antibodies drop to zero within 2-4 months Bell *et al* (2004). In our findings age-related differences in prevalence of tick infestation were significant. Prevalence of tick infestation was comparatively higher in adult cattle than young animals. The reason behind this difference may be due to outdoor management and far-reaching movement of adult cattle for search of food and water while calves are limited to grazing areas near to home which is less infested. The present study is in agreement with the results of Atif *et al*. (2012) who reported the uppermost prevalence of tick infestation (71.61%) in adult animals over 5 years of age while the lowermost (20.80%) was recorded in animals below one years of age. The statement of Barnett and Bailey (1955) also supports our conclusions that young cattle have an age related resistance to most tick borne protozoan parasites. Similarly Randuz (2008) admitted the importance of colostrum feeding in calves that produces immunity against diseases. It is assumed that strong innate immunity of calves is favorable for less exposure to tick infestation. Colostrum plays significant role in the health of new born and considered as the first source of nutrient after birth. Colostral antibodies provide protection from diseases in early life until calf's own defense system becomes functional but in contrast with findings of present study Manan *et al*. (2007) reported higher tick infestation in young animals less than one year (24.5%) followed by 1-2 years (20.5%) and adult farm animals above 2 years (19.20%) respectively. There is similar agreement that Zebu cattle have better tick resistance than European cattle. In present study the upper most prevalence of tick infestation was recorded in Holstein Friesian followed by Crossbred cattle and BhagNari breed respectively. The findings are correlated with the judgments of Sohail *et al*. (2007) who recorded higher prevalence of tick infestation in Holstein Friesian (86.16%) followed by Crossbred (84.16%) while the lowermost prevalence (23.16%) was recorded in local cattle breed (Sahiwal). The mechanism involved in tick tolerance are not yet clearly understood but may be connected with immunological response, skin sensitivity and their odor attractive to ticks. In local breeds the possible causes may be due to strong natural immunity. It has been recognized that some breeds of cattle improve immunity after repeated tick infestation and also the complement system helps in the development of immunity against the ticks (Brossard and Wikel 2007). Similarly Muhammad *et al* (2008) well defined the factors involved in the ability of Zebu cattle breeds against tick resistance i.e. thick moveable hides, short and

straight hairs, sensitive pilomotor nervous system, an erector pili muscle which makes the hairs standup provocation by flies, ticks etc. and stimulates the secretion of sebum in the hairs which is repellent for ticks. On the other hand exotic breeds and crossbred cattle are more susceptible than native breeds. Similar observations were made by Atif *et al*. (2012) who reported significantly higher tick infestation in crossbred cattle (80.31%) than local cattle (30.35%). The findings are supported by Rajput *et al*. (2006) who stated that dual purpose cattle breeds are highly resistant to tick infestation but in contrast with our observations Kabir *et al*. (2011) noted significantly higher tick infestation (43.82%) in local cattle than crossbred cattle (24.13%). They assumed the reason behind this difference might be due to lack of framers interest in local breeds while taking more interest/care to cross bred. The sex of cattle also effect on the prevalence of tick infestation. In this study the prevalence of tick infestation was higher in female than male animals. Similar results were confirmed by Kabir *et al*. (2011) who recorded significantly higher prevalence of tick infestation in female (59.37%) than male cattle (35.83%). They found the female animals 2.61 times more susceptible than male. The exact cause of higher tick prevalence in female is not clear but hormonal influences, immunosuppression in pregnancy, lactation and stresses support the higher prevalence of tick infestation but the judgments are not in agreement with the findings of Atif *et al*. (2012) who noticed the uppermost prevalence of tick infestation in male (56.46%) rather than female (54.17%). The results of season wise tick infestation revealed significantly higher tick infestation (84%) in summer season while the lowermost (4.66%) during winter season. The observations are in line with Abidi *et al*. (2010) who reported higher tick infestation during the months of summer while low mass of tick infestation (12.69%) was recorded in winter season. Similar observations were recorded by Manan *et al*. (2007) who noticed higher tick infestation in August while the lowermost in December and January. They noted higher prevalence of tick infestation in August (25.8%) followed by September (21.3%), October (15.8%), November (10.5%), February (8.4%) December (6.7%) and January (6.7%) respectively. Statement by Atif *et al*. (2012) supports our observation that *boophilous microplus* tick is an active vector responsible for the spread of hemoprotozoan parasites in Pakistan. Similar observations were noted by Rony *et al*. (2010) who identified *boophilus* tick (45.63%) followed by *Rhipicephalus sanguineus* (10.50%) as the most prevalent tick species in cattle in Gazipur district, Bangladesh.

Prevalence of most dominant tick species, predilectionsites and severity of tick infestation: The results of severity/density of tick infestation in different seasons revealed mild tick infestation in March, April, October and November, moderate in August and September while severe tick infestation in May, June and July.Similar observations were made by Manan*et al*. (2007). They identified almost the same tick speciesi.e. *Boophilus* (46.1%) *Hyalomma* (31.25%) and *Rhipicephalus* (17.93%) respectively. Similar observations were presented by Teglas *et al*. (2005) who reported higher prevalence of *Boophilus microplus* (54%) in cattle during a study conducted in Guatemala. The present study showed the presence of ticks with different proportions in different regions of the body. Among these udder including teats, perineum and external genitalia was found highly tick infested regions. The present study revealed the most dominant tick species; *Boophilus* (35.5%) with predilection sites i.e. dewlap, shoulder area, external genitalia and udder region legs particularly hind legs, abdominal area and in some cases head regions particularly neck. Similarly *Hyaloma* (26.5%) was noted with predilection sites; external genitalia, udder and perineum region. These findings are correlated with the conclusions of Moges *et al*. (2012) who reported tick infestation in 169 native cattle in Chilga district, Ethiopia. They observed the highest tick infestation in June while the lowest infestation during the month of February and recorded almost the same predilection sites of ticks as noticed in present study. They recorded higher prevalence of *Amblyomma* (53.35%) followed by *Rhipicephalus* (35.35%) and *Boophilus* (3.57%) which does not match with the results of present study which recorded higher prevalence of *Boophilus spp.* followed by *Hyaloma*. This difference might be due to variation in study area and breeds of cattle studied. Their observations are in agreement with the present study that the ticks were widely scattered in different parts of the host body such as ear, neck, tail, udder, groin and anal area.

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