

EPIDEMIOLOGICAL STUDY ON TICK INFESTATION IN INDIGENOUS AND CROSS BREED CATTLE IN HYDERABAD PAKISTAN

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ABSTRACT: The survey on tick infestation in indigenous and cross breed cattle was carried out in urban and peri-urban dairy farms of Hyderabad and Kotri, Sindh, Pakistan during August to November, 2016. Three hundred cattle were physically examined, out of which, 72 were infested with ticks. Overall tick infestation rate was recorded as 24%. Tick infestation in indigenous cattle was found higher (29.6%) than the cross breed cattle (19.77%). Ticks of *Hyalomma* genus were found on cattle in study area. The gender-wise prevalence of tick infestation in females was higher (32.11%) than the males (15.79%) in indigenous cattle but in cross breed cattle tick prevalence was higher in males (23.07%) as compared to the females (19.49%). Among the age groups, the tick infestation was higher (40.74%) in calves up to 1 year age group compared to 1 to 3 years (24.48%), 3 to 5 years (29.41%) and above 5 years (27.77%) of age in indigenous breeds. While, prevalence of tick infestation was higher (38.88%) in calves up to 1-year age group than 1 to 3 years (14.81%), 3 to 5 years (20%) and above 5 years (22%) in cross breeds. Tick infestation in indigenous cattle breeds was recorded as 65.78, 18.43 and 15.79%, respectively. In case of cross breed cattle, infestation of tick was recorded as 79.42, 11.76 and 8.82% as low, medium and high infestation, respectively. Overall, owner's response rate toward the treatment applied to the removal of ticks as hand picking (50%), Ivermectin injection (15%) and Acaricide spray (10.53%). It was concluded that the *Hyalomma* tick is threat to the local and cross breed cattle in Hyderabad and Kotri.

Key words: Tick infestation, resistance, indigenous, crossbreed, cattle

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INTRODUCTION

The livestock plays a significant role in global economy, particularly in the developing countries. Livestock is source of energy, food, raw materials and manure for crops. It is therefore not surprising that the livestock sector, especially the dairy sector, has emerged as an important economic source for a vast majority of the rural population and a target for agri-business in dairy, meat and various other products in the processed food sector. Ticks cause substantial losses in cattle production in terms of diseases, reduced productivity, fertility and often death and are economically the most important ecto-parasites of cattle (Rajput *et al.*, 2006; Aslam *et al.*, 2015; Juan *et al.*, 2019). Livestock shows a key role in Pakistan's economy by uplifting the socio-economic conditions of resource-poor husbandry communities and reducing poverty (Jabbar *et al.*, 2015). The livestock sector in Pakistan is represented mainly by small farm holders to meet the needs of nutrients and proteins, food security, and income. In the financial year 2013/2014, the livestock sector contributed 11.8 % to the

Gross Domestic Products (GDP) of Pakistan; its share in the value of all agricultural commodities was 55.9 % (PES, 2014). Ticks were considered as parasites of domestic animals as early as 400 B.C. Aristotle in his famous historian *imallium*, stated that the ticks were disgusting parasites 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 (Dobbelarece and Heussler, 1999, Kakar *et al.*, 2017; Atif *et al.*, 2012; Hailemariam *et al.*, 2017). Ticks are cosmopolitan in distribution, but occur principally in tropical and subtropical regions with warm and humid climate which are suitable to undergo metamorphosis (Kilpatrick *et al.*, 2007; Durrani *et al.*, 2009; Abdul *et al.*, 2017). In order to know the susceptibility of indigenous and cross breed animals to tick infestation, this study was planned to inspect occurrence of tick infestation in indigenous and cross breeds of cattle and to assess the risk factors associated with tick infestation in Hyderabad and Kotri.

MATERIALS AND METHODS

Total 300 animals of indigenous and cross breed of cattle were physically examined for the presence of ticks during study period of August to November-2016. Information for age, sex, body scoring and managerial factors was collected through a questionnaire by visiting twenty dairy farms of Hyderabad and Kotri. The physical examination of animal was preferred to observe the presence and severity of the tick infestation. Animals were grouped according to their age as A (up to 1 year), B (3-5 years) and C (Above 5 years) according to the classification method used by Bitew (2011). Likewise, the body condition score (bony, fair and fatty) was based on the criteria set by Nicholson and Butterworth (1996). Data on tick collection was computed to calculate their rate of prevalence following multifactorial parameters including overall rate of infestation, tick burden, inter and intra specific association, location, specification, trend of infestation and projected prevalence. Various risk factors (Age, sex, breed type and managerial factors) were calculated with the association on the presence or absence of ticks. During the survey, four types of local breeds (Red Sindhi, Sahiwal, Kankrej and Thari) and cross breeds (Fresein, Holstein, Jersey and Mix cross) were present at dairy farms of the study area.

Collection of ticks: Five visible ticks from each animal were collected in 70% alcohol from different body parts including eye, body, nose, legs and udder of the infested cattle by hand picking carefully without breaking mouth part for identification (Kabir *et al.*, 2011). Specimen were mounted on the slides in Canada balsam and kept in the level position until hardened (Kabir *et al.*, 2011).

Identifications of the tick was made under the binocular microscope with the help of keys (mouth part and genital aperture) described by (Soulsby, 1982).

Statistical analysis: The collected data were analyzed using SPSS version 20. Prevalence was determined by the formula described by Thrusfield (2005). In all analysis, 95% confidence intervals and $P < 0.05$ were set to indicate significance.

RESULTS

Out of 300 animals, 72 (24%) had tick infestation. The infestation rate was recorded as 29.69% and 19.77% in local and cross breeds of cattle, respectively (Table-1). Only *Hyalomma* tick was identified during the survey in study area (Figure-1). Proportion of tick infestation in local and cross breeds was non-significant ($P > 0.05$).

Table-2 showed the rate of tick infestation in local and cross breeds of cattle. In local breed types, infestation rate was 30.61, 30, 14 and 33.33% in Red Sindhi, Sahiwal, Kankrej and Thari, respectively. On the other hand, the tick infestation rate recorded in cross breed was 27.45, 19.58, 0 and 5.26% in mix cross, Friesen cross, Holstein cross and Jersey cross, respectively. Proportion of breed wise infestation in local and cross breeds of cattle was non-significant ($P > 0.05$).

Table-3: revealed the gender-wise prevalence in local and cross breed of cattle. Prevalence in male and female of local breed was 15.79% and 32.11% respectively. While, prevalence of tick infestation in male and female of cross breeds was 23.07% and 19.49%, respectively. Proportion of gender-wise tick infestation in local and cross breeds cattle were non-significant at $P > 0.05$ level.

Table-1: Prevalence of tick infestation in local and cross breed cattle.

Type of cattle	No. of animals examined	No. of animals infested	Percentage	P value
Local Breed	128	38	29.69	3.009
Cross Breed	172	34	19.77	
Total	300	72	24	

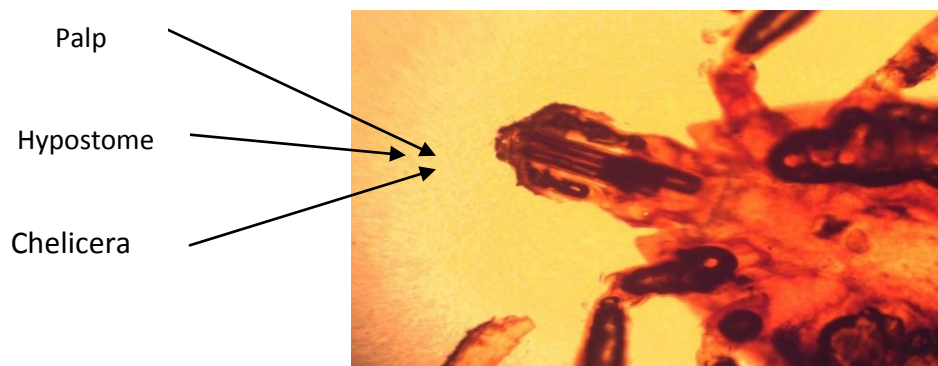


Figure-1: The mouth parts including chelicerae of *Hyalomma* tick under stereo microscope(4X).

Table-2: Prevalence percentage of tick infestation of local and cross breed cattle.

Breed of cattle		No. of animals examined	No. of animals infested	Percentage	P value
Local breed	Red Sindhi	98	30	30.61	0.603
	Sahiwal	20	6	30	
	Kankrej	7	1	14.28	
	Thari	3	1	33.33	
Cross breed	Mix cross	51	14	27.45	4.514
	Freisen cross	97	19	19.58	
	Holstein cross	5	0	0	
	Jersey cross	19	1	5.26	
Total		300	72	24	

Table-3: Gender-wise prevalence percentage of tick infestation in local and cross breed cattle

Gender	Local breeds		Prevalence Percentage	Chi sq.	Cross Breed		Prevalence Percentage	P Value
	Animal Examined	Animal Infested			Animal Examined	Animal Infested		
Male	19	3	15.79	1.460	13	3	23.07	0.082
Female	109	35	32.11		159	31	19.49	
Total	128	38	29.68		172	34	19.76	

Table-4: Age-wise prevalence percentage of tick infestation in local and cross breed cattle.

Age	Local breeds			Chi Sq.	Cross breed			P- Value
	Animal Examined	Animal Infested	Prevalence Percentage		Animal Examined	Animal Infested	Prevalence Percentage	
Up to 1 Year	27	11	40.74	1.577	18	7	38.88	4.391
1 to 3 Years	49	12	24.48		81	12	14.81	
3 to 5 Years	34	10	29.41		55	11	20	
Above 5 Years	18	5	27.77		18	4	22	
Total	128	38	29.69		172	34	19.77	

The age-wise prevalence of tick infestation was recorded as 40.74% and 24.48%, 29.41% and 27.77% in calve up to 1 year, 1 to 3 year, 3 to 5 and above 5 years age group of local breedsof cattle, respectively. In cross breed the age group calve upto 1 year, 1 to 3 year, 3 to 5 and above 5 years cattle were infested with prevalence rate of 38.38% and 14.81%, 20 and 22%, respectively (Table-4). Proportion of gender wise tick infestation in local and cross breeds cattle were non-significant at $P>0.05$ level.

Table-5: Demonstrates owner's response rate towards the tick removing, out of 65 owners 58.46% responded as "yes". While, 41.54% said to "no" for removal of the tick from the body of animal.

Table -6 showed the type of treatment applied for the removal of ticks from animal. Half of 38 owner said that they have used hand picking method. While 39.47% and 10.53% owner used Ivermectin and Acaricide spray to remove the tick from the body of animal.

Table-5: Owner's response towards the methods for tick removing.

Method for tick removing	No. Respondent	Percentage
Positive	38	58.46
Negative	27	41.54
Total	65	100

Table-6: Types of treatment used by owners for tick removal.

Method for tick removing	No. of Respondent	Percentage
Hand Picking	19	50
Ivermectin (Injection) administration	15	39.47
Acaricide Spray	4	10.53
Total	38	100

DISCUSSION

This study revealed that overall tick infestation in cattle was recorded as 24%. Results are quietly different with Kabir *et al.*, (2011) who reported that infestation rate in cattle was 36.31% at Chittagong District, Bangladesh. Our result is different from the findings of Asmaa *et al.*, 2014 who reported infestation (60.5%) high in cattle at Benisuef district. Result variation might be due to different area and climate condition. In local breed of cattle, Red Sindhi, Sahiwal, Kankraj and Thari tick infestation was 30.61%, 30%, 14% and 33.33%, respectively. On the other hand the tick infestation rate was recorded in cross breed, 27.45%, 19.58%, 0 and 5.26% mix cross, Friesen cross, Holstein cross and Jersey cross, respectively. The exact cause of higher prevalence of tick infestation in local breeds of cattle is not well understood but it can be assumed that it might be lack of interest of the farmer about local breeds and taking more care of cross breed than the local cattle. Breed type investigations for tick infestation in local and cross breed of cattle during this study revealed that the local breeds of cattle were found more infested (29.6%) than the cross breed cattle (19.77%). These results are in line with (Kabir *et al.*, 2011) who reported infestation was highly prevalent in local cattle (43.82%) as compared with the cross breed cattle (24.13%) at Chittagong District, Bangladesh. This variation might be due to the geographical location, condition of climate and managerial practice in study area.

In present study, tick infestation was high in female (32.11%) than the male (15.79%) in local breed, on the other hand, tick infestation was higher in male (23.07%) compared to the female (19.49) in cross breed cattle. The result is different from that reported by Kabir *et al.* (2011) who described that tick infestation was significantly higher in female (59.37%) than the male cattle (35.83%) at Chittagong District, Bangladesh. Result of another researcher was different from this study. (Musa *et al.*, 2014) reported high tick infestation in male (63.4%) compared with female (60.9%) in Maiduguri, Northeastern Nigeria. Actual reason of tick infestation in female cattle is not clear but it can be hypothesized the hormonal influence may reduce immunity in females and thus there is high prevalence rate in female cattle.

During the present study local breed tick infestation rate was high (40.74%) in calves up to 1 year compared to the other age groups of cattle *i.e.*, 1 to 3 year (24.48%), 3 to 5 (29.41%) and above 5 years (27.77%). In cross breed cattle tick infestation (38.88%) was also high in calf up to 1 year as compare to 1 to 3 year, 3 to 5 and above 5 years was (14.81%, 20% and 22% respectively). These result differ from the (Kabir *et al.*, 2011) who reported the prevalence was significantly high in cattle of 1.5 years of age (46.28%) as compare to

the cattle >1.5 years of age (27.80%). Present study result also differ from the (Patel *et al.*, 2012), they noticed high infestation rate in the group of animals less than 1 year age (80.21 %) followed by group of animal age between 1 to 3 years (68.48 %) and lowest in group animal of age greater than 3 years (44.85 %) at Mathura district, Uttar Pradesh. It is very difficult to describe exactly the normal incidence of tick infestation in adult and calves, ticks suck the blood for their survival and reproduction which may be main reason for higher in rate of tick infestation in young cattle.

Only *Hyalomma* tick species was found on local and cross breed cattle in study area. (Kebede *et al.*, 2012) identified the tick species were *Amblyomma variegatum* (49.2%), *Boophilus decoloratus*, (21.2%), *Hyalomma marginatum* (9.8%), *Hyalomma truncatum* (6.2%), *Rhipicephalus evertsievertsi* (6.6%), and *Rhipicephalus pulchellus* (5.3%) in Awi zone, Amhara region. (Sultana *et al.*, 2015) reported the dominant specie of ticks *Hyalomma anatolicum anatolicum* was observed on cattle (55.45%). High prevalence of *Hyalomma* tick species, this could be due to fact, *Hyalomma* was the common and widely distributed on cattle in study area. The dominant *Hyalomma* over others genera because of the native distribution of ticks on the distribution of cattle as host and climate condition.

In this study local breed tick frequency percentage was high in bony 57.89%, medium in fair 23.68%, and low 18.43% in fatty body status. In case of cross breed the frequency percentage was high 52.94% in boney, medium 35.29% in fair, and low 11.77% in fatty body status of cattle. Present study result was totally differ with the results of (Alemu *et al.*, 2014) reported that the prevalence of tick infestation was highest in poor body condition (98%) while the medium in medium body condition (76.11%) and low in good body condition (74.04%) in Northwest Ethiopia.

Local breed cattle tick frequency percentage was higher 50% on udder as compare to the other body parts such as face cum neck, groin, udder, ear and tail cum peri-anal in the study area. Similarly, in cross breed tick frequency percentage was higher 55.88% on udder as compare to the other body parts such as face cum neck, groin, udder, ear and tail cum peri-anal, respectively. These result agree to some extent with Asmaa *et al.*, (2014) reported the preferred sites of ticks attachment to animals were udders and external genitalia (70.7% each) then Neck & chest (63.0% of each), inner thighs (61.1%), perineum (41.7%), ears (14.6%), around eyes (11.7%) at Benisuef district. Mossie *et al.*, (2016) results differ from present study. The effect of feeding wise tick infestation in local breed and cross breed was recorded as (57.89 % versus 42.11%) and (79.41% versus 20.59%) in stall feeding and grazing cum stall feeding, respectively. frequency percentage of stall feeding was higher than the both grazing cum stall feeding. These results were

different from Kabir *et al.* (2011) reported the field grazing (41.96%) cattle were more susceptible to tick infestation than the stall-feeding (24.8%) animals at Chittagong District, Bangladesh. High tick infestation may be due to the management system where animals are allowed to graze together in field and in mixed farming system of study area. Tick frequency percentage (55.26%) was high in local breed cattle living in Kacha housing system as compared to the cattle living in cemented housing (44.74%) in study area. Frequency percentage (52.95%) was also high in cross breed cattle living in Kacha housing system as compared to the animal living in cemented housing (47.05) the owner's response rate towards the methods for tick removing 41.54% and 58.46% owners responded "yes" and "no", respectively. Difference may be due to the ticks hide himself in ground and laying eggs in Kacha housing system, after hatching seed ticks start to suck blood from host animal.

Conclusion: It was concluded that tick infestation in indigenous cattle was found higher (29.6%) than the cross bred cattle (19.77%). It was concluded that the *Hyalomma* tick is threat to the local and cross breed cattle in Hyderabad and Kotri.

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