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Influence of Animal Factors on the Prevalence of Ixodid Ticks on Cattle in Telangana State, India

Jayalakshmi Jaliparthi[1*], Udaya Kumar Manchukonda[2], Sreenivasa Murthy, G.[2], Kalyani Putty[3] and Narendra Kumar Gonepudi[4]

[1]Department of Veterinary Parasitology, Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh, INDIA
[2]Department of Veterinary Parasitology, P.V. Narsimharao Telangana Veterinary University, Hyderabad, Telangana, INDIA
[3]Department of Veterinary Biotechnology, P.V. Narsimharao Telangana Veterinary University, Telangana, INDIA
[4] Department of Veterinary Public Health and Epidemiology, N.T.R College of Veterinary science, Gannavaram, Andhra Pradesh, INDIA

**Corresponding author: J Jaliparthi; E-mail: raghava.plr@gmail.com*

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ABSTRACT

A yearlong survey was conducted between March 2019 to February 2020 to study the influence of animal factors like age, breed, sex and managemental practices on the prevalence of Ixodid ticks on cattle in Telangana State, India. An overall prevalence of 63.4% of tick infestation was recorded where as it was significantly higher in cross bred cattle than indigenous animals. Among cross breeds, 80 % of prevalence was recorded in Holstein Friesian and 77.24% in Jersey cross with a non-significant difference. Among the indigenous, non-descriptive cattle showed significantly ($p<0.05$) higher prevalence (53.2%) than Sahiwal (39.6 %) and least in Gir (21%). Age wise studies indicated more tick infestation in less than 1year age cattle (70.4%) followed by above 3 years (63.4%) and >1-3-year age group (51.6%). Female cattle were more prone to tick infestation (67.3%) than males (49.9%). Cattle reared under unorganized farms (71.3%) were more infested than in organized farms (50.7%). The current information on regional prevalence is essential for development and modulation of tick control measures for better production and economic stability.

HIGHLIGHTS

- Calves less than 1year age and female cattle were more prone to tick infestation.
- When compare to all breeds of cattle under study HF cross was more susceptible to tick infestation.

Keywords: Cattle, Telangana, Ixodid ticks, animal factors

Cattle have been the source of small, marginal and landless farmers, a majority of whom live below the poverty line. Although India is ranking first in the total milk production, the tropical livestock productivity is quite low (De Leon *et al.,* 2020) because of the neglected management and poor health of animals due to various factors including diseases as well as their transmitting agents (ectoparasites). Among ectoparasites, ticks are the important blood-feeding ectoparasite of mammals, birds, reptiles and amphibians throughout the world (Brites Neto *et al.,* 2015). They affect about 80% of the cattle population of the world. Vector-borne diseases directly or indirectly affect the growth of livestock industry and responsible for a variety of losses by causing mortality of animals, decreased production, down grading and rejection of skin and hide.

Betancourt (2017) mentions that the losses caused by the infestation with ticks, the associated diseases and control of them have calculated at USD 13.9-18.7 billion per year. In tropical and subtropical areas of the world, management

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of tick infestations and the transmission of tick-borne diseases remain a problem for the cattle industry. Tick monitoring is a priority for many countries including India (Ghosh *et al.,* 2014). Because of the changing environment, the epidemiology and vector potentiality of ticks are likely to be change and failure to control tick infestation is a major factor limiting the sustainable livestock production. Hence, an epidemiological survey was conducted to study the prevalence of tick infestation in different categories of cattle of Telangana for a period of 1 year from March, 2019 to February, 2020.

MATERIALS AND METHODS

Cattle were selected from six erstwhile districts of Telangana state for the present study. The tick infestation was studied in relation to age, breed, sex during the period from March, 2019 to February, 2020. The influence of managemental practices like organized and unorganized farming systems on tick infestation were also studied.

Collection of ticks

Ticks were collected by grasping them between finger and thumb and then Gently pulling them out from the skin. Few ticks were collected by using forceps, taking special care while detaching ticks from animal body to avoid damage to mouth parts (Fig. 1). The collected samples were then transferred to self-locked test tube marked with permanent marker with detailed information such as age (i.e. < 1 year, 1 to 3 years and >3 years of age), sex (male/female), breed (cross breed, indigenous and non descript and managemental practices (organized/ unorganized farms) about the source of sample collected. After collection, ticks were brought to the laboratory in test tubes closed with muslin cloth to allow air and moisture exchange. Later, ticks were fixed in 70% alcohol and preserved in 70% glycerinated alcohol. The Identification of ticks was made with the help of Pictorial Key as describe by Soulsby (2005).

STATISTICAL ANALYSIS

The epidemiological data obtained from the study was analysed by chi-square test in statistical software SPSS 16.0. The results with a greater number of proportions were analysed by Marascuilo test as described by Marascuilo and McSweeney (1967).

RESULTS AND DISCUSSION

During the present study, a total of 8872 cattle were examined for the presence of ticks from organised and unorganised dairy farms in six districts of Telangana. Out of that total, 5625 (63.4%) cattle were found to be positive for tick infestations. Balasubramanian *et al.* (2019) and Kaur *et al.* (2017) observed an overall prevalence rate of 68.2 % and 59.1 % tick prevalence at Tamil Nadu and Mizoram which is comparable to the present observations. On contrary to the present findings Shyma *et al*. (2013) recorded an overall prevalence of 22.4% of Ixodid ticks in cattle of Kerala. High prevalence of ticks may be due to high annual rainfall, humidity and 40.6% irrigated lands in Telangana favour the growth of herb, shrub, grass which create a favourable sheltering place for ticks throughout the year as opined by Kakar *et al.* (2017). In the present investigation, two indigenous breeds viz., Sahiwal and Gir, two cross breeds viz., Holstein Friesian (HF cross) and Jersey cross (J cross) and non descript cattle were found in different districts. Among the 5625 tick infested animals, the prevalence of tick infestation was significantly ($p<0.05$) higher in HF cross (80.04%) compared to other breeds. Viz., Jersey cross (77.24%), non-descript (53.2%), Sahiwal (39.6%) and Gir (21.05%) in descending order. The results were presented in (Table 1). Multiple proportions of Merascuilo test indicated significant ($P<0.05$) differences among all breeds except in between Holstein Friesian cross and Jersey cross and the critical value is 9.48.

Table 1: Breed wise prevalence of Ixodid ticks on cattle in Telangana state

Breed	No: of cattle examined	No: of tick infested cattle	Percentage infested
Non-descript	3402	1813	53.2^{c}
Sahiwal	603	239	39.6^{b}
Gir	494	104	21.0 ^{a}
Jersey cross	1116	862	77.2^{d}
HF cross	3257	2607	80.0^{d}
Total	**8872**	**5625**	**63.4**

***** Superscripts with dissimilar alphabets indicate significant ($P \leq 0.05$) difference between values.

Fig. 1: Photographs showing tick infested areas on different body parts of cattle

Exotic and crossbred cattle are the frequent victims of massive tick attacks than indigenous cattle as opined by Tabor *et al.* (2017). The mechanism of tick tolerance is not clearly understood, but may be connected to immunological response and variations in the mechanisms by which each host breed responds to different bioactive molecules secreted by ticks. However, cross breeds were more susceptible to tick infestation which may be due to their production of more tick attracting volatile compounds (Franzin *et al*., 2017) and genes involved in inflammatory processes and immune responsiveness were upregulated (Piper *et al*., 2017) whereas in indigenous breeds, higher levels of T cells present in the skin prior to tick infestation respond to ticks more efficiently (Tabor *et al*., 2017). The another reason of less tick infestation in local breeds might be due to strong natural, stable, long lasting and heritable host resistance and thick movable hides covered with short straight non-medullated hair, well developed panniculus muscle, high density of sweat glands and secretion of sebum in the hair which act as repellents for ticks (Nath *et al.*, 2018).

In present study, there was significant ($p<0.05$) difference existed between indigenous breeds being highest in ND cattle and low infestation in Gir and Sahiwal could be due to breeding strategies which followed in Sahiwal and Gir resulting in well-developed genetic resistance. Low caring and non-following of breeding strategies could be the reason for a significantly higher tick infestation in ND cattle. The results were comparable to those of Ghosh *et al.* (2019) who reported more susceptibility of HF cross to tick infestation (71.94 %) than Jersey cross (61 %) and least in Zebu cattle (31.1%). Similar results were reported by Aboma *et al*. (2017) and reported, more interest and care of farmers on cross breeds than on local breeds as the cause of higher rate of tick infestation in local animals.

The prevalence in different age groups of animals showed that, significantly ($p<0.05$) higher rate of tick infestation was recorded in calves of <1 year of age (70.4%), followed by above 3 years' age group (63.4%) and least in >1-3-year age group (51.6%) (Table 2).

Higher tick infestation in calves could be due to under developed immune system of calves, lack of proper care by the owners especially in case of male calves, overcrowding, malnutrition, less active grooming and limited recommendations of the acaricidal application in younger animals (Singh *et al*., 2013). Lower tick infestation

on 1-3 years age cattle may be due to better managemental practices including self-grooming by the animal, eating of ticks by tick predators while grazing and no production stress at this age leads to less susceptibility to ticks. Kaur *et al.* (2017) reported 79.2% prevalence in cattle below 2 years of age 68.3 % in 2-8 year aged cattle. Patel (2013), Ghosh (2019) also made similar observations.

Table 2: Age wise prevalence of Ixodid ticks on cattle in Telangana

Age	No: of cattle examined	No: of tick Infested cattle	Percentage infested
<1 year	2821	1987	70.4[a]
1-3 years	1745	902	51.6[c]
>3 years	4306	2736	63.4[b]
Total	**8872**	**5625**	**63.4**

*Superscripts with dissimilar alphabets indicate significant (P ≤0.05) difference between values.

Among the cattle population examined, significantly higher infestation of Ixodid ticks was observed in females (67.2%.) when compare to male (49.9%) cattle (Table 3).

Table 3: Sex wise and farm wise prevalence of Ixodid ticks on cattle in Telangana

Sex	No: of cattle examined	No: of tick infested cattle	Percentage infested
Male	1972	984	49.9[b]
Female	6900	4641	67.26[a]
Total	8872	5625	63.4
Organised farm	3425	1738	50.7b
Unorganised farm	5447	3887	71.3a
Total	**8872**	**5625**	**63.4**

*Superscripts with dissimilar alphabets indicate significant (P ≤0.05) difference between values.

Significantly higher infestation in female cattle could have been resulted due to immune suppression occurring during the late pregnancy and early lactation as opined by Kabir *et al.* (2011) reported significantly ($p<0.01$) higher prevalence in female (59.37 %) than in male (35.83 %) cattle and the rate of infestation in female cattle was 2.61 times more than in males. Similarly, Ghafar *et al*. (2020) observed 46.5% prevalence in female cattle which is higher than male. Higher level of prolactin and progesterone makes the female animal more susceptible to any infection (Singh *et al.,* 2013).

In the present study, it was observed that managemental practices of the cattle had a profound effect on the prevalence of the ticks. Cattle reared in unorganized farms were more infested with ticks (71.3 %) than in organized farms (50.7%) (Table 3). Similar opinion was expressed by Mushahary *et al.* (2019) who reported 49.3% of tick infestation in free range cattle than the stall-feeding animals (41.5%) and Ahmad *et al.* (2019) also reported 23% of prevalence in rural areas of Islamabad but no ticks were reported from well-organized Livestock Research farm. In present study more prevalence of ticks in cattle reared in unorganised farms could be due to improper cleaning of shed which leaves hided engorged females, nymphs, larvae in the cracks and crevices of the shed, lack of regular washing and grooming of the animals, regular grazing in fields which increased the chance of re-infestation of ticks.

CONCLUSION

In conclusion, this study discusses the findings of a survey conducted to determine the influence of animal factors, such as breed, age, sex, and type of farm management (organized/unorganized), on the prevalence of ticks on cattle in Telangana state, India. The findings varied depending on the animal-related factors mentioned. Furthermore, it has been found that tick infestation is an ongoing issue with prevalence rate of 63.4% in cattle throughout the study locale, suggesting that this is a neglected barrier to the health and proper growth of Telangana's cattle wealth. To avoid financial losses brought on by such infestation and the spread of infections to domestic animals and people, control measures should receive a greater emphasis. Therefore, strategic tick control initiatives should make use of the epidemiological data from the current study.

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