

Research Article

Prevalence of tick infestation in goats reared under semi-intensive system

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Abstract

Study was conducted on total of 300 goats from 10 villages of Taluka Khipro, District Sanghar for the presence of tick infestation. The prevalence of tick infestation in goats was recorded as 74.33%. The highest tick infestation rate was observed in Haji Ilyas Rajar (93.33%), and the lowest (50%) was noticed at Karim Bux Laghari. Gender wise tick infestation prevalence of both male and female in goats was recorded as 56.25% and 82.84%, respectively. The age-wise tick infestation was observed 172 (80%) in adults and 51 (60%) in young goats. The most common tick infestation sites were recorded ears (46.4%) followed by tail region (28%) and around the eyes (9.6%). The four species of ticks infesting the goats were observed as *Hyalomma anatolicum*, *Amblyomma variegatum*, *Boophilus microplus*, and *Rhipicephalus anguineus*. While the high intensity of tick infestation was recorded of *Hyalomma anatolicum* (43.04%) followed by *Amblyomma variegatum* (26.90%), *Boophilus microplus* (16.14%) and *Rhipicephalus anguineus* (13.90%). All tick-infested goats showed clinical signs of weakness, anaemia, and anorexia. Study concludes that the *Hyalomma* was the most prevalent species of tick infesting the goats reared under the semi-intensive system. Adult female goats were more susceptible to tick infestation compared to the young males.

Keywords: Damage; External parasites; Goat; Prevalence; Tick

Introduction

Among all the domesticated animals, goat plays a significant role in the livestock sector with the estimated population of 63.3 billion heads in Pakistan, which makes it the 3rd major goat rearing country in the world after India and China [1]. Goats fulfill the demand of meat, milk, skin and by-products for national and international export [2]. There are various diseases of the goat including bacterial, viral, protozoal and

metabolic disorders that causes economic losses. Further, external parasites like lice, ticks and mites are also very common in goats that cause major constraint in production, morbidity and mortality with clinical signs of anemia, weight loss, retarded growth, paralysis, reduce production and intense irritation leading to skin damage that causes huge economic losses by reducing the quality and market value of skin [3, 4]. Tick infestation in goats

causes weakness and decreases production that has a serious economic impact on the goat farming and individual and national goat production in developing countries. It has been recommended that developing countries like Pakistan must ensure a proper tick control program [5]. The major constraint in ticks and other external parasite control is the use of chemical treatment in which ticks develop chemical resistance [6]. The misuse of drugs with wrong concentration is a leading cause of the failure of the tick control programs [7, 8].

Ticks are the part of class *Arachnida*, order *Acari* with suborder *Ixodida*. Ticks have been classified into three families i.e. *Argasidae* (soft ticks), *Ixodidae* (hard ticks) and the monotypic family *Nuttalliellidae* [9]. *Hyalomma*, *Boophilus*, *Haemaphysalis* and *Rhipicephalus* are very common tick species present in Pakistan [10]. The highest tick infestation causes the anemia to animals by sucking the host blood during their prolonged attachment of the lifecycle phase of 7-14 days, which may be long depending on tick species and host association [11]. In severe infestations, the adult and growing larvae of the ticks suck 0.5–2.0 ml blood/day and causes morbidity and mortality [12]. Tick species that remain and has two molting periods on same host are called one-host ticks. While in two host tick species, the larvae molt to the nymphal stages on the same host but after engorging nymphs disappear from the host and molt in the nearby environment and then transferred to the new host. However, lifecycle of three host ticks depends on both the larvae and nymph that leave the host to molt in another host, as attach again to the host after each phase of molting [13]. Ticks are the main vector of *Hemorrhagic fever* and other protozoal diseases such as *Babesiosis*, *Anaplasmosis*, *Theileriosis*, and *Ehrlichiosis* in livestock, and further, they cause severe anemia, loss of production, weakness, and immune-suppression in the infected animals. However, animal body temperature favors their growth and

survival ability with relative humidity (85%) and temperature (26-37°C). These requirements always favor the growth and reproduction of ticks [14].

Infestation of ticks is no doubt a dangerous threat to the goat farmers of the developing countries like Pakistan, where people are totally dependent on goats for their livelihood. Studies on the tick prevalence has been observed in goats worldwide [15, 16], but in Sindh province of Pakistan especially the Khipro district still there is need of lot of investigation on the ticks. Current study was therefore planned to identify the most prevalent species of ticks among the goats in the vicinity of Khipro district, so that, species specific control may be implemented accordingly.

Materials and methods

The present study was carried out to observe the infestation of different tick species in the goats from June to September 2017. Three hundred (300) goats were selected randomly for the collection of adult ticks (have complete morphological characteristics) from the different areas of the body of the goats from the vicinity of Ten villages of Taluka Khipro, district Sanghar. All ticks were collected without damaging their mouth parts using tissue forceps as described by [17].

Collection bottles were prepared for the collection of tick species. A small quantity of plaster of Paris was placed at the bottom of each bottle so that the moisture could be maintained in the bottles. A small hole was made on the cork of each bottle with a pincer, so that, air can be passed easily. Finally bottles were covered with airy cloth and kept into bags. All collected ticks were transported to the Department of Veterinary Medicine, Sindh Agriculture University, Tando Jam for further processing. The ticks were boiled in a solution of Potassium Hydroxide 10% (KOH) for fifteen minutes and temporary mounting was done by glycerin for identification of different species under an electrical binocular lens microscope.

Preparation of preservation solution

Solution of chloroform in 10% formalin was used for further processing, mounting and identification of ticks. Formalin with chloroform was prepared by taking 10ml of pure formalin and dissolving into 90ml distilled water then chloroform was added gradually.

Identification and mounting of tick species

All collected ticks were gently shifted into test tubes having a solution of 10% Potassium Hydroxide (KOH). The solution containing ticks were boiled for periods of 15 to 20 minutes to remove the hard scutum and then allowed to cool. After cooling preserved ticks were detached from the test tubes and passed through the grades of ethanol for dehydration viz 20%, 70%, 90% and 100%. In each grade of Ethanol, ticks were kept for 2 hours before shifting them to a higher grade. All ticks were washed in running tap water and transferred in the clove oil for 24-48 hours to keep soft muscles of ticks. Ticks were prepared on a glass slide for the permanent mounts by using Canada balsam (SYN, England) as a sticking agent. Glass slides were covered with cover slip to make them permanently mounted. Ticks were identified by using a bi-ocular microscope.

Tick identification

Ticks were identified with the help of the published key [18]. Identification was based on taxonomic characters including body length, mouth parts, integument texture, length of maxillary palp, basis capula, scutum color and lateral margins, genital aperture, rings and pulvilli on legs. There were no hard-fast rule to categorize ticks as un-engorged, partially-engorged and fully engorged. However, the un-engorged tick was considered as larval stage with 6 legs, partially engorged tick was recognized from partially stretched body with mouth parts fully penetrated host body and fully engorged tick depicted blood filled body.

Statistical analysis

The collected data were tabulated in Microsoft Excel and statistical analysis was performed using Statistical Package for Social Sciences (SPSS) Version 24.0. The statistical differences between groups were considered significant at ($p < 0.05$).

Results

Results concerning the prevalence of tick infestation in Taluka Khipro and its surroundings are presented in the Table 1. A total 300 goats of both sexes were examined for the presence of different species of ticks from 10 villages of Taluka Khipro. The examined goats revealed 223 (74.33%) tick infestation. The village wise study data demonstrated that the highest tick infestation rate was observed (93.33%) in Haji Illyas Rajar, and the lowest tick infestation rate (50%) was observed in Karim Bux Laghari. Statistically there was no significant difference between the villages of Taluka Khipro against tick infestations (Table 1).

Gender wise prevalence of tick infestation in goats at Taluka Khipro is shown in the (Table2). It is given in the table that the female although were more susceptible to tick infestation (82.84%) compared to males (56.25%), but statistically no significant difference was observed. Further, age wise prevalence of tick infestation in goats is given in the (Table3). Table 3 shows the high rate of infestation 172 (80%) was observed in adult goats followed by young goats 51 (60%). Statistically data showed no significant difference between the age groups.

Results regarding the common predilection sites of tick infestation in goats are shown in the (Table 4). Results shows that the most common predilection sites of tick infestation on the animal body surface was observed ears (34.4%) followed by tail region(28%), around eyes (19.2%), udder, thigh and testes (14.4%), neck and chest (2.4%),and all over the body (1.6%).

Furthermore, the species-wise frequency of ticks in goats is depicted in the Table 5. Results reveals that among all tick species,

the highest ticks recovery was observed *Hyalomma anatolicum* (43.04%) followed by *Amblyomma variegatum* (26.90%), while minimum tick species infestation was

recorded of *Rhipicephalus anguineus* (13.90%) infesting goats in the study area (Table5).

Table 1. Village wise prevalence of tick infestation in goats

S No.	Name of villages	Total no of animals Examined	No. of affected Animals	Prevalence (%)	Chi sq.	P value
1	Haji IllyasRajar	30	28	93.33	4.05*	0.9078
2	Aso Dahar	30	27	90		
3	Jean haar	30	25	83.33		
4	Gul Mohd Hingorja	30	24	80		
5	Mir Hassan Shar	30	24	80		
6	Jan Mohd Mor	30	22	73.33		
7	Pir Bux Liskani	30	21	70		
8	Dodo Chaniho	30	19	63.33		
9	Lal Khan Khaskheli	30	18	60		
10	Karim Bux Laghari	30	15	50		
Grand Total		300	223	74.33		

Table 2. Gender wise prevalence of tick infestation in goats

Sex	No of animals examined	No of animals infected	Prevalence (%)	Chi sq.	P value
Male	96	54	56.25	3.79*	0.0516
Female	204	169	82.84		

Table 3. Age wise prevalence of tick infestation in goats

Age	No. animals examined	No. animals affected	Percentage	Chi sq.	P value
Adult	215	172	80.00	1.98*	0.1589
Young	85	51	60.00		
Total	300	223	74.33		

Table 4. Tick infestation at different body parts of goats

Body parts of the goat	Mild tick infestation (Average)	Percent (%)	Moderate tick infestation (Average)	Percent (%)	High tick infestation (Average)	Percent (%)
Both ears	08	40	18	36	33	42.31
Tail, anus and vagina region	04	20	13	26	19	24.36
Around eyes	04	20	12	24	14	17.95
testes, udder, and thighs	02	10	03	06	07	8.97
Neck and chest	01	05	02	04	03	03.85
All over the body	01	05	02	04	02	02.56
Total no. infested	20	100	50	100	78	100

Table 5. Species-wise tick frequency percentage in goats

Tick Species	Female Goat	Frequency (%)	Male Goat	Frequency (%)	Total (Male + Female)	Frequency (%)
<i>Hyalomma anatolicum</i>	70	42.68	26	44.06	96	43.04
<i>Amblyomma variegatum</i>	47	28.65	13	22.03	60	26.90
<i>Boophilus microplus</i>	25	15.24	11	18.64	36	16.14
<i>Rhipicephalus anguineus</i>	22	13.41	9	15.25	31	13.90
Total	164	100	59	100	223	100

Discussion

The present study was carried out in Khipro, district Sanghar to evaluate the presence of tick species infesting the goats. The four species of ticks were identified infesting the goats (*Hyalomma anatolicum*, *Amblyomma variegatum*, *Boophilus microplus*, *Rhipicephalus anguineus*), which is in close agreement with [19], who reported that the ticks identified from Tando Jam and its surrounding were the same as observed in the current study. The highest prevalence of the tick infestation was recorded of *Hyalomma anatolicum* (43.04) and the lowest of *Rhipicephalus anguineus* (13.90). These results are in close agreement with the study conducted by [19], who reported that *Hyalomma anatolicum* was predominant tick species in goats followed by *Rhipicephalus sanguineus*, the prevalence of *Hyalomma anatolicum* and *Rhipicephalus anguineus* was 42.7% (309/723) and 37.6% (272/723), respectively while 19.6% (142/723) of animals were infested with both the species from Layyah and Muzaffargarh (Pakistan). In contrast, the lower prevalence of *Rhipicephalus anguineus* difference may be due to the climate condition like a hot and humid environment of the study area. [20] reported the similar results that *Hyalomma anatolicum* and *Rhipicephalus anguineus* ticks infestation recorded in goats were 44.17 and 13.59 from Tando Jam and its surrounding (Pakistan), respectively. Further, similar results were observed by [21], who reported the tick infestation rate in goats from India during the summer season. The overall tick prevalence rate was

observed 72.11%. The only three tick species were identified *Rhipicephalus (Boophilus) microplus*, *Haemaphysalis spp* and *Hyalomma spp* 47.11%, 16.34%, and 8.65%, respectively. Our results are in close agreement with previous study. Further, the major infestation site of the tick was observed higher in both ears 42.30% and lowest no of ticks was observed around rest of the body 2.56%, these results are similar with the previous study conducted by [21]. They reported the tick infestation variation on the various body parts of the goats. The most common tick predilection sites were observed on the ears (53.57%) followed by anus and external genitalia (14.58%) and around eyes (6.25%) in goats. The ticks were present on the internal ears site and the ear margin. The other reason might be that the attachment of tick was dependence on the body temperature of the animal. This could be the best reason amongst others for the presence of almost increase in the intensity of ticks in the ear. Our study was mostly conducted and completed during the summer season, so it may be a reason that most of goats showed high-intensity ticks infestation at ears. Moreover, in the present study, the clinical findings in goat were observed such as dullness and depression in severe tick-infested animals, decreased appetite, and mucous membrane was in pale color indicating anemia, thin body condition with dry and rough body coat, hair losses at ears, weakness. The clinical findings observed were similar to the study conducted by [22] who reported direct blood losses results from heavy tick burden as well as the appearance of toxicosis in sheep. The tick

bites can be injurious that causes severe skin damages, abscess formation at the infestation site and were the entry site for the secondary bacterial infection. Another similar type of study was conducted by [23] recorded that disorders of the blood, anemia, hypersensitivity, irritability, dermatitis, skin necrosis, low weight gains, secondary infection, focal hemorrhages and inflammation of the ear orifices. Further, [24] reported that ticks also cause retard growth and reduce the productivity of the goats in Abuja, Nigeria. So these findings were similar to previously reported.

Conclusion

Present study concludes that among all tick species the *Hyalomma* was the most prevalent species of tick infesting the goats reared under the semi-intensive system at Khipro. Females of adult age were more susceptible to tick infestation in contrast to males of young age.

Authors' contributions

Conceived and designed the experiments: AA Jariko, RA Leghari & AA Khaskheli, Performed the experiments: AA Jariko & RA Jariko, Analyzed the data: M UR Memon & MQ Koondhar, Contributed reagents/materials/analysis tools: JA Gadahi & MA Jariko, Wrote the paper: AA Khaskheli.

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