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Prevalence of Hard Ticks in Cows and Buffaloes in District Malakand, Pakistan

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Ectoparasites adversely affect the Animals; lower their economic production level, such as by causing irritation, anemia and increase the cattle and buffaloes morbidity ratio. The present study of ectoparasites prevalence was carried out in District Malakand. A total population of 600 (Male n = 300 and Female n = 300) cattle and buffaloes belong to different age and sex groups were randomly captured for ectoparasites prevalence during June to August 2019. Among them, 515 (85.8%) were found to be infested by one or more species of ectoparasites. In females, the infestation recorded was higher (92.3%) as compared to the male (79.3%). Seven species of ectoparasites were identified from cattle and buffaloes. In cross young cattle in *Dermacenter* 45(7.5%), *Ixodes* 57(9.5%) *Boophilus* 50(8.3%), *Hemophysalis* 47(7.8%), *Hylomma* 40(6.6%) while in adult infestation were notice such as *Dermacenter* 58(9.6%), *Ixodes* 68(11.3%), *Boophilus* 50 (8.3%), *Hemophysalis* 59(9.8%), *Hylomma* 61(10.16%). The infestation rate is high in the cross breed of an adult as compared to young cattle. The infestation occurred in young local cattle due to *Dermacenter* 46(7.6%), *Ixodes* 34(5.6%), *Boophilus* 36(6%), *Hemophilus* 36(6%), *Hemophysalis* 35(5.8%), *Hylomma* 29 (4.8%). While in local adult cattle infestation was recorded in the genera of *Dermacenter* 47 (7.8%), *Ixodes* 53 (8.8%), *Boophilus* 46(7.6%), *Hemophysalis* 48(8%), *Hylomma* 41(6.8%). The infestation rate was also observed based on the sex factor in adult cattle and buffaloes. During the study, it was noticed that the total infestation rate in females was high (92.33%) as compared to males (79.33%). While the non-infestation rate was 7.66% in the female which is less as compared to male (20.66%).

Keywords: Prevalence, Hard Ticks, Cows, Buffaloes, Malakand

INTRODUCTION

Ticks are obligatory hematophagous ectoparasites of birds, reptiles, and especially of mammals, and have great medical and veterinary

importance (Mehlhorn and Armstrong, 2010). Ticks cause a variety of diseases to human and domestic stock because they are vectors of bacterial, protozoal, spirochaetal, rickettsial, and

viral organisms. Ticks are important to ingesting stocks, and human beings (Akhtar *et al.* 2011); (Ullah *et al.* 2020). There are about 907 valid species of ticks and most of them are ectoparasites of wildlife (Jongejan and Uilenberg, 2004), some of them play important role in spreading different diseases among livestock and human beings throughout the world (Jongejan and Uilenberg, 2004).

Ticks have worldwide distribution and have a preference for humid and temperate atmospheres and typically attach to the legs, underarms, and abdomen of their host body (Nuttall, 1905). Tick infestation decreases the quality of the skin (hide) up to 20- 30% (Gharbi *et al.* 2006); (Khan *et al.* 2021) and causes severe anemia, weakness, and immunosuppression in the infected animals (Gwakisa *et al.* 2001). Family Ixodidae (hard ticks) contains 713 valid species and is the largest family of ticks (Barker and Murrell, 2004).

In dairy cows, milk production is greatly reduced. Although, economic losses due to ticks are mainly due to the diseases which they transmit (Garcia, 2003); (Atif *et al.* 2012). Numerous species of hard ticks including those from the genera *Boophilus*, *Haemaphysalis*, *Hyalomma*, *Amblyomma*, and *Rhipicephalus* are reported infesting cows, buffalo, and other cattle in India and other parts of the world (Shahardar *et al.* 1998).

Prevalence of *Hyalomma* species in Pakistan is significantly higher reported to be the most prevalent member of *Ixodidae* (hard ticks) infests buffalo, cattle, and other wild animals in countries of Africa, Europe, Middle East, and South Asia (Dumanli *et al.* 2005); (Ahmad and Ahmad, 2007). The density of tick's infestation is mainly determined by the age, sex, environmental condition, nutritional and lactation status of the animal (Sajid *et al.* 2008).

The current study was designed due to serious economic loss to the farmer and tanning industries in Pakistan and Due to limited information on taxonomy and tick infestation in district Malakand. The comparative prevalence study will help us in controlling zoonotic disease to the designed quick estimation of tick's population in district Malakand because ticks are not only vectors but excellent reservoir hosts for the virus.

Keeping in view the importance of ectoparasites infestation on cows and buffaloes, the present study was designed;

1- To Identify and compare the species of ticks in district Malakand that infest cows and buffaloes of the region and their distribution by sex and age of infected animals.

To make a recommendation to assist owners, government, and other relevant agencies for planning control measures.

MATERIALS AND METHODS

1. Study Area

The present study was conducted in District Malakand, Khyber Pakhtunkhwa (Fig. 1) located at 24° 33' 56" N and 71° 55' 52" E and covers 952 km² area (District census report, 1998).

1.1. Live Stock Situation in the Study Area

The major livestock raised in the area is sheep and goats with a sufficient number of cattle, donkeys and horses (District census report, 1996).

1.2. Sampling sites

Samples were randomly collected from the Malakand district during the summer season from June to August in 2014. For the sampling purposes, the area was selected from Tehsil Dargai and Batkhela and included Meherdi, Sakhakot and Ghari Usmani Khel of Tehsil Dargai and Thana, Peeran and Agra of Tehsil Batkhela.

1.3. Materials

Appropriate labeled capped bottles, surgical gloves, forceps, slides, coverslip, spirit lamps, stirring rod, a tea strainer, test tube, balance, test tube stand, cotton, beaker, potassium hydroxide (KOH), ethyl alcohol (C₂H₅OH), xylol, clove oil, Canada balsam, stereomicroscope, data book and pen.

1.4. Preliminary survey

The survey was conducted in June, July and August 2014. The sampling was done from 09:00 am to 03:00 pm, on daily basis. A total of N=600 animals, consisting of cows and buffaloes 300 each was included. In cows, the male to female ratio numerically was 23 males and 277 females. While among buffaloes, the male to female ratio was numerically 15 males and 285 were females. The identification and laboratory work of the ectoparasites was carried out in the Microbiology and Parasitology laboratory of Veterinary Research and Diagnostic Station (VRDS) Balogram, Swat.

1.5. Sample collections

Ticks collection was made by using forceps or with hand from six different body sites on each animal (*viz.* ear, side of the neck, leg including the foot, the whole tail including the tail brush, half of

the lower perineum and the whole upper perineum). These regions of cattle were selected due to the high density of ticks found in these areas. Ticks from the different body regions of each animal were placed separately in small bottles containing Boardman's solution (17% alcohol, 03% Di-ethyl ether and 80% water) to exterminate them. They were removed from this solution after 24 hours and placed in labeled vials containing 70% ethanol for long-term preservation.

1.6. Sample Processing

After the preservation, the ticks were processed in the laboratory. The preserved ticks were shifted to potato tubes containing 15% solution of potassium hydroxide (KOH) and for 10-20 minutes were boiled over a spirit lamp and to wash out the excess alkali ticks were washed with tap water. Heavily chitinized and Dark specimens were usually treated with a strong alkaline solution to dissolve their soft organs and bleach those muscles and fats so that chitinous plates are more clearly seen.

Further, the ticks were dehydrated; for this purpose, they were passed through a series of different grades of aqueous solution of ethyl alcohol, that is 20, 30, 40, 50, 60, 70, 80, 90, and 95% allowing for two hours in each grade. After the last series of the aqueous solution of alcohol, i.e. 95%, the ticks were then washed to remove excess alcohols for this purpose the ticks were then put under tap water. After washing the tick was then transferred to a container having aniline

oil for 24-48 hours to be cleared. After clearing the specimens sink to the bottom for further clearance, the clearing agent was removed and the specimens were washed with two changes of xylol. During processes, care was exercised in handling and collecting the materials to prevent breaking of legs and mouthparts, etc. Further, the sample was transferred on a glass slide and Canada balsam was applied. The samples were covered with coverslips and kept in an oven for an adequate time under a suitable temperature combination for dehydration (Soulsby, 1982).

1.7. Microscopic Study

The light microscopy was carried out with the help of a stereo-microscopic magnification power with the objective lenses of 10x, 40x and 100x.

1.8. Identification

After microscopy, the collected specimens poured in transparent Patri dishes from labeled vials, were visualized for initial identification with the help of a stereomicroscope. In individual Petri dishes, the specimen was mixed in 100% ethanol and segregated in different orders. After the separation in different orders, each order was further studied in detail with the help of a microscope. Through the help of fine forceps, the ectoparasites were placed on slides and camel hair brush for microscopic examination and identification with the help of a stereomicroscope.

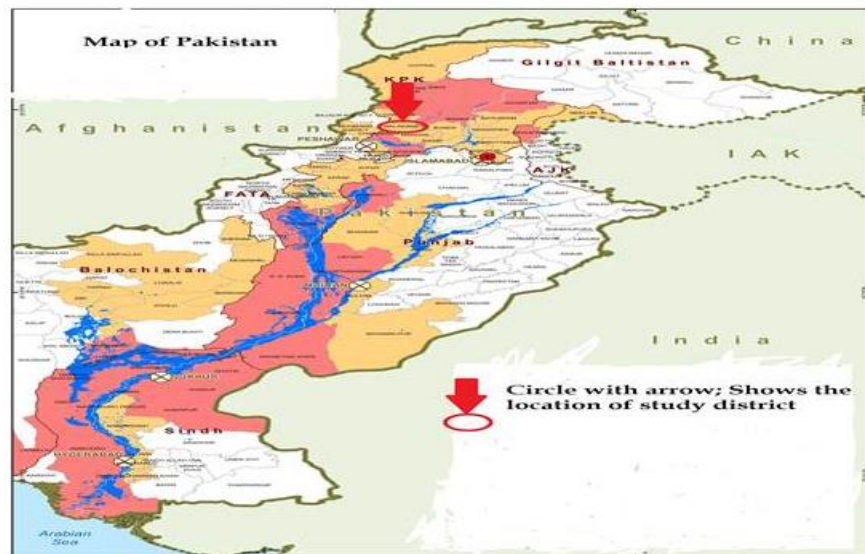


Figure1: Map of District Malakand Khyber Pakhtunkhwa, Pakistan.

1.9. Identification Keys

The collected ticks fauna was identified with the help of different standards published texts and keys such as that of (Soulsby, 1982).

1.10. Slide Preparation Method

To prepare permanent slides, the specimens were preserved and placed on the slides according to the technique of Palma, (1978). The specimens were selected. For neutralization, 10% aqueous acid was used for 30-40 minutes. Staining was performed in concentrated acid fuchsin solution for 8-16 hours. For dehydration in each concentration, various grades of alcohol were used such as 40%, 70%, and 100% ethanol for 30-40 minutes. For 24 hours clearing or washing was performed with clove oil and then the slide was labeled. For mounting Canada balsam and xylene were used. Finally, the slide was dried in an oven at 50-55°C for three (3) weeks (Palma. 1978).

1.11. Photography from Slides

Photographs were taken with the help of stereomicroscope and 12-megapixel digital cameras (Nokia Mobile N8-00).

RESULTS

Overall ectoparasites infestation

The survey was conducted in Malakand district in June, July and August 2019. This study analyzed a total of 600 animals (300 cows and 300 buffaloes). In cows, the male to female ratio was numerically 23 males to 277 females. While among buffaloes, the male to female ratio was numerically 15 males to 285 females. Out of a total of 600 animals, 515 were found positive for the presence of different tick species. In the case of cows, 281 (54.5%) were found infected, whereas 234 (45.4%) buffaloes were found to be infested with ticks (Table. 1).

Area and sex distributions of animals within the survey region

In Tehsil Dargai three villages Meherdi, Sakhkot, and Gari Usman Khel and in Tehsil Batkhela three villages Thana, Agra and Peeran were identified and surveyed for the study. A total of 100 animals were selected from both planned species each from cows and buffaloes.

Distribution of selected animals based on their breeds and age

Out of three villages of Tehsil Dargai, N=95

animals were analyzed from Meherdi (Table 3.2). A total of 42 cattle were selected from the local breed and 13 were recorded as a cross breed. Within the local breed, 24 animals were adults while 18 were found to be young. Similarly, among crossbreed, 04 animals were adult and 09 were young while a total of 40 buffaloes the young and adult breed were 13 and 27 respectively (Table. 2).

In the second village Sakhkot, 90 animals were analyzed. A total of 33 animals were selected from the local breed and 15 were recorded as a cross breed. Within the local breed, 22 animals were adults while 11 were found to be young. Similarly in crossbreed 10 animals were adult and 05 were young. While a total of 42 buffalo the young and adult breed were 17 and 25 respectively.

In the third village Ghari Usman khel, 85 animals were analyzed. A total of 28 animals were selected from the local breed and 18 were recorded as a cross breed. Within the local breed, 18 animals were adults while 10 were found to be young. Similarly, in crossbreed, 11 animals were adult and 07 were young. While a total of 39 buffalo the young and adult breed were 18 and 21 respectively.

Out of three villages of Tehsil Batkhela, 80 animals were analyzed from Agra. A total of 32 animals were selected from the local breed and 12 were recorded as a cross breed. Within the local breed, 21 animals were adults while 11 were found to be young. Similarly in crossbreed 09 animals were adult and 03 were young. While a total of 36 buffalo the young and adult breed were 11 and 25.

In the second village Thana, 84 animals were analyzed. A total of 28 animals were selected from the local breed and 18 were recorded as a cross breed. Within the local breed, 16 animals were adults while 12 were found to be young. Similarly in crossbreed 12 animals were adult and 06 were young. While a total of 38 buffalo the young and adult breed were 15 and 23.

In the third village Peeran, 81 animals were analyzed. A total of 27 animals were selected from the local breeds and 15 were recorded as a cross breed. Within the local breed, 19 animals were adults while 08 were found to be young. Similarly in crossbreed, 11 animals were adult and 04 were young. While a total of 39 buffalo the young and adult breed were 13 and 26 respectively.

Table 1: Total infested and non-infested animal's observed.

Animal specie	Number	Infested	Percentage%	Non- infested	Percentage %
Cattle	300	281	46.8%	19	3.6%
Buffaloes	300	234	45.4%	66	12.8%
Total	600 (100%)	515 (85.8%)	100%	85	16.5%

Table 2: Distribution of overall infested animals based on their breeds and age

Tehsil	Village	Cattle	Local	Cross	Young	Adult	Buffaloes	Young	Adult	Total
Dargai	Meherdi	55	42	13	25	30	40	11	09	95
	Sakhakot	48	33	15	13	35	42	07	12	90
	GU khel	46	28	18	15	31	39	05	18	85
Total	3 Villages	149	103	46	53	96	121	23	29	270 (52%)
Batkhela	Thana	46	28	18	10	36	38	15	23	84
	Agra	44	32	12	15	39	36	11	25	80
	Peeran	42	27	15	12	30	39	13	26	81
	Total	3 villages	132	87	45	37(17)	105	113	39	74
Total % ge	6 villages	281(54%)	190(36%)	91(17%)	90(17%)	201(39%)	234(45)	62(12%)	103(20%)	515(100%)

Table. 3 Distribution of Local and Cross cattle based on their breeds and Age per village

Tehsil	Village	Local	Young	Adult	Cross	Young	Adult
Dargai	Meherdi	42	18	24	13	04	09
	Sakhakot	33	11	22	15	05	10
	G U khel	28	10	18	18	07	11
Batkhela	Thana	28	12	16	18	06	12
	Agra	32	11	21	12	03	09
	Peeran	27	08	19	15	04	11
2 Tehsil	6 village	190	70	120	91	29	62

Prevalence of tick infestation between both groups of animals

Comparative ticks prevalence between total cattle and buffaloes were recorded, the infestation rate of ticks was found to be 90 in young and 191 in adult cattle and 87 and 147 were observed in buffaloes, respectively. Ticks prevalence was recorded higher 54.5% in cows as compared to buffaloes which ratio is 45% (Table. 4).

Table 4: Comparison of infestation between cattle and buffaloes

		No of Animals	% age
Cattle	Young	90	17
	Adult	191	37
	Total	281	54.5
Buffaloes	Young	87	16.8
	Adult	147	28.5
	Total	234	45
Total		515	100

Comparative analysis among young animals

The tick's infestation preference was found in young cattle with a ratio of 54.5% over young buffaloes where the ratio was lower at 16.8 % (Table. 5).

Table 5: Comparative prevalence of tick's infestation among young animals

Species	Breed	Young	Infested (%)
Cattle	Local	190	36.8
	Cross	91	17.6
Total		281	54.5
Buffaloes		87	16.8
Total		368	71.4

Comparative analysis among adult animals

The tick's infestation preference was found higher in adult cattle with the ratio of 35% over adult buffaloes where the ratio was 85 % (Table. 6).

Table:3.6 Comparative prevalence of tick's infestation among adult animals

Species	Breed	Adult	Infested (%)
Cattle	Local	120	23
	Cross	62	12
Total		182	35
Buffaloes		147	28
Total		329	63

Distribution of tick's genera in young and adult cattle's based on local and crossbreeds

The infested young cattle breed based on age

factor were recorded and the five genera of family Ixodidae such as *Amblyomma*, *Ixodes*, *Boophilus*, *Hemophysalis*, and *Hylomma* were observed during the study. In young local cattle, the infestation rate was investigated as in *Amblyomma* 39 (7.5%), *Ixodes* 43 (8.3%), *Boophilus* 35 (6.7%), *Hemophysalis* 32 (6.2%), *Hylomma* 41 (7.9%) while in cross cattle infestation were noticed such as *Amblyomma* 19 (3.6%), *Ixodes* 21 (4%), *Boophilus* 16 (3.1%), *Hemophysalis* 17 (3.3%), *Hylomma* 18 (3.4%). The infestation rate is high in the cross breed of young as compare to local young cattle. Whereas in adult local cattle the infestation rate was recorded as in *Amblyomma* 23 (4.4%), *ixodes* 27 (5.2%), *Boophilus* 24 (4.6%), *Hemophysalis* 25 (4.8%), *Hylomma* 21 (4%) while in adult cross the ratio was observed such as in *Amblyomma* 13 (2.5%), *ixodes* 15 (2.9%), *Boophilus* 10 (1.9%), *Hemophysalis* 11 (2.1%), *Hylomma* 13(2.5%) describing that the infestation rate was high in adult local as compare to adult cross. (Table. 7)

Genera based comparison of infestation in young and adult buffaloes

A total of five genera belonging to family ixodidae were recorded/identified with a ratio such as of *Dermacenter* was found to be 20 (3.8%) in young and 35 (6.7%) in adult, *Ixodes* 17 (3.3%) and 28 (5.4%), *Boophilus* 15 (2.9%) and 33 (6.4%), *Hemophysalis* 16 (3%) and 31 (6%), and in *Rhipicephalus* 19 (3.6%) and 20 (3.8%) (Fig. 3). The overall infestation ratio of the adult is high as compared to young buffaloes.

Comparative Prevalence of Ticks on Monthly basis in Local and Cross Breed Cattle

The comparative prevalence of ticks was recorded in the summer season in June, July and August in 2019, on local and crossbreed cattle (Table. 9). The infestation rate was high in July (Cross 6.6% and local 13%) and August (Cross 6% and local 12.6%) as compared to June (Cross 5% and local 11.2%) while in these months the total infestation rate was found as 54.5% in district Malakand.

Comparative Prevalence of Ticks every month in buffaloes

The comparative prevalence of ticks on monthly basis in buffaloes was found high (Table. 10) in July 82 (15.9%) and August 80 (15.5%) as compared to June 72 (13.9%).

Comparison of Infestation Percentage among the animals of two Tehsils

The infestation rate was compared between both Tehsils of the study area (Table. 11). In Tehsil Batkhela, the total infestation rate was found to be 245 (47.5%) while in Tehsil Dargai it was recorded as 270 (52.4%).

Comparison of infestation rates based on sex factor between both groups

The infestation rate was observed based on sex factors in cattle and buffaloes (Table. 11). During the study, it was noticed that the total female infestation rate was high 477 (92.6%) as compare to the male which is 38 (7.3%).



(A) *Amblyomma* (Female)



(B) *Hylomma* (Female)



(C) *Ixode* (Female)



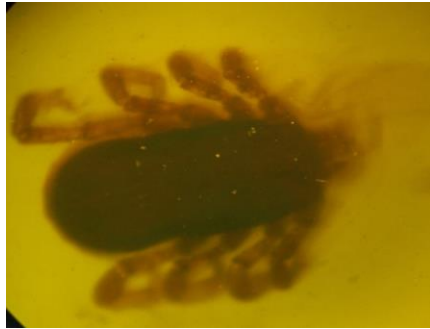
(D) *Rhipicephalus* (Female)



(E) *Boophilus* (female)



(F) *Amblyomma*(female)



(G) *Dermacentor* (female)

Figure 2: shows 7 Genera of ticks *Amblyoma*, *Boophilus*, *Hemophysalis*, *Ixodes*, *Hylomma*, *Dermacentor* and *Rhipicephalus* were recorded from animals.

Table. 7. Infestation percentages of tick's genera in young and adult Cattle based on local and crossbreeds

S.No	Genera	Young Local	%age	Young Cross	%age	Adult local	%age	Adult cross	%age
1.	<i>Amblyomma</i>	39	7.5%	19	3.6%	23	4.4	13	2.5
2.	<i>Ixodes</i>	43	8.3%	21	4%	27	5.2	15	2.9
3.	<i>Boophilus</i>	35	6.7%	16	3.1%	24	4.6	10	1.9
4.	<i>Hemophysalis</i>	32	6.2%	17	3.3%	25	4.8	11	2.1
5.	<i>Hylomma</i>	41	7.9%	18	3.4%	21	4	13	2.5
6.	Total	190	36.8%	91	17.6%	120	23.3	62	12

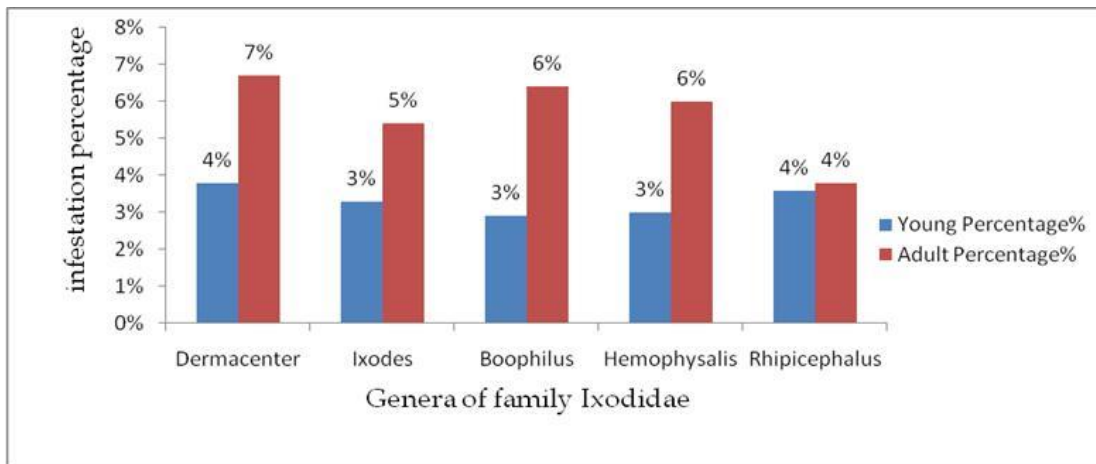


Figure 3: Comparison of infestation percentages of genera from family ixodidae on young and adult buffaloes.

Table 8: Comparative Prevalence of Ticks on Monthly basis in Local & Crossbreed Cattle in Malakand

Seasonal Month	Breed	No. of Animals Examined	Infestation	Total
			% age	
June	Local	58	11.2	84 (16.3)
	Cross	26	5	
July	Local	67	13	101(19.6)
	Cross	34	6.6	
August	Local	65	12.6	96 (18.6)
	Cross	31	6	
Total		281	54.5	

Table 9: Ticks prevalence monthly in buffaloes

Seasonal Month	No. of Animals Examined	Infestation
		% age
June	72	13.9
July	82	15.9
August	80	15.5
Total	234	45.4

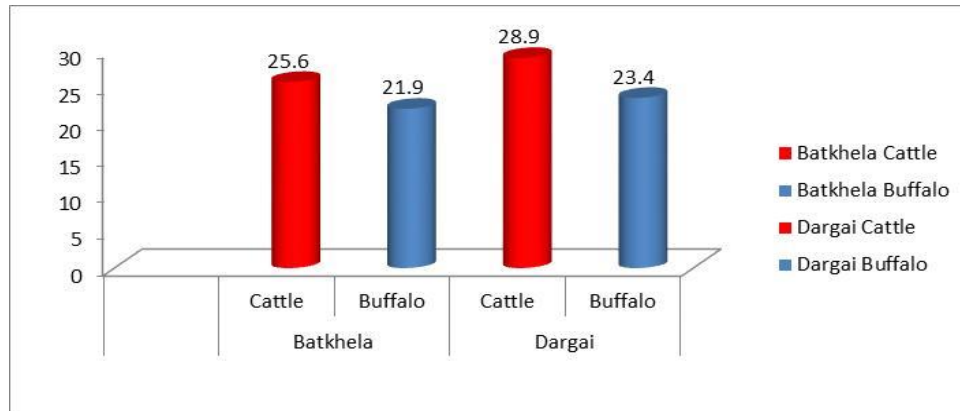


Figure 3.3 Comparison of infestation rates between both Tehsil

Table 10: Comparison of infestation rates between male and female animals

S/No	SEX	SPECIE	TOTAL EXAM	INFESTED
				PERCENT
1.	Male	Cattle	23	4.4%
		Buffalo	15	2.9%
		Total	38	7.3%
2.	Female	Cattle	258	50%
		Buffalo	219	42.5%
		Total	477	92.6%
Total			515	85.83%

DISCUSSION

The survey was conducted in Malakand district in June, July and August 2019. During the current study, it was observed that the high infestation rate in cross cattle was caused by *ixodes* (4% in young and 2.9% in adult). While in local young cattle high infestation was caused by *Hylomma* (7.9%) and adult by *ixode* (5.2%) respectively. In buffaloes, high infestation rate was recorded by the same genus *Dermacentor* in young with ratio of (3.8%) and in adults the ratio was (6.7%). The overall rate of tick infestation in cattle and buffaloes was found 515 (85.83%) and the non-infestation rate was observed at 85 (14.16%). The high infestation rate was observed in July (19.6%) in cattle and buffaloes (15.9%). During this study, the infestation on sex basis was recorded as Male (7.3%) and Female (92.6%).

The result of the present study is in close conformity with Wahid et al. (2004) who observed five species of family ixodidae infesting different

animals in Punjab Pakistan such as buffaloes, cows, goats, and sheep in their study. They notice that *Hylomma anatolicum anatolicum* and *Haemophysalis (H) Sulcata* occurred throughout the year; however, the infestation of *Haemophysalis (H) sulcata* was more common as compared to that of *Hylomma anatolicum anatolicum*. They also investigated that high infestation of ticks was recorded in September, August, and October when the relative humidity was 84% and mean temperature was (27C⁰) so both the statement shows that the high infestation rate was recorded due to suitable temperature and humidity for tick's infestation throughout the year.

During the present study, the infestation on sex basis showed Male (7.3%) and females (92.6%). According to Sayin et al. (2003) who noticed that the "female ticks" have higher distribution as compared to "male ticks". Aktas et

al. (2004) also reported that the female tick's population of *Hylomma* species was higher than male ticks.

During the current survey in young cattle, the prevalence of infestation rate was investigated as in *Amblyomma* 58(11.2) 45 (7.5%), *Ixodes* 64 (12.4%) *Boophilus* 51 (9.9%), *Hemophysalis* 49 (9.5%), *Hylomma* 59(11.4) (6.6%) while in adult infestation were noticed such as *Amblyomma* 36(6.9) (9.6%), *Ixodes* 42 (8.1 %), *Boophilus* 34 (6.6%), *Hemophysalis* 36 (6.9%), *Hylomma* 34 (6.6%) this result is in close conformity with the research finding of (Manan et al. 2007) who reported prevalence of *Boophilus*, *Hylomma* sp, *Rhipicephalus* sp, and *Amblyomma* sp was 46%, 31.25%, 17.9%, and 4.6% respectively in Peshawar region. (Rehman et al. 2004) who observed that in Rawalpindi and Islamabad area, the *Boophilus* species *Amblyomma* species and *Rhipicephalus* species are not recorded but the prevalence of *Haemophysalis* sp is 74% and *Hylomma* sp is 26% is common.

According to the present study, the comparative prevalence of ticks on monthly basis in buffaloes were found high in July 82 (15.9%) and August 80 (15.5) due to ambient environmental condition as compared to June 72 (13.9%). This is closely related to the work of (Ahmad et al. 2013) who reported the minimum tick population is due to low temperature and less humidity and short day. These results have been found to encounter similarity with the previous report of Atif et al. (2012) who concluded that the maximum prevalence infestation of ticks was observed in July and June in all study districts and showed that in all study regions mean maximum temperature was significantly involved on the month-wise prevalence of ticks. The difference in the infestation rate in different months of the present study has close conformity with the finding of (Sajid, 2007) who reported in July the highest abundance of ticks whereas (Durrani, 2008) and (Ahmad and Hashmi, 2007) who in Malakand region during August recorded the highest prevalence of ticks and *Babesia bigemina* infection in cattle, which lies in the northern hilly cooler region of Pakistan.

CONCLUSION

A total of N=600 animals were selected, (300 cows and 300 buffaloes). Out of the total 600 specimens examined during the study, a total of 515 animals were found positive, being infested with different tick species. In Cattle species out of 300 samples, 281 (54.5%) were found infested,

whereas in buffaloes 234 (45.5%) were found to be infested. Among cows, the male to female ratio was numerically 23 males to 277 females. While among buffaloes, the male to female ratio was numerically 15 males to 285 females. All the Cattle and Buffaloes studied were found infested by a total of seven (7) genera of acarine ectoparasites. These were *Amblyomma*, *Boophilus*, *Hemophysalis*, *Ixodes*, *Hylomma*, *Dermacenter*, and *Rhipicephalus* recorded in the current study.

CONFLICT OF INTEREST

The authors declared that the present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

MA wrote the manuscript and designed the research methodology. IT, SRS, ZU and SM verified the methods. MSK, MFK, NA, GBK, and AA discussed the results and contributed to the final manuscript. ZU, SM, RAK, NA, SY, MS reviewed the manuscript. All authors read and approved the final version.

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