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Knowledge, Attitude and Practices of Livestock Owning Community on Tick Born Zoonosis and Parasite Control in District Okara, Punjab, Pakistan

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ABSTRACT

The aim of current study was to present a cross section of knowledge, attitude and practices (KAP) of livestock farmers on tick born zoonosis, community led treatment and control of internal and external parasites in livestock. The study was conducted with a total of 72 respondents, mostly small holders including males and females through an open ended survey questionnaire in tehsil Depalpur and Renala khurd, district Okara, Punjab, Pakistan. The overall KAP status of farmers on identification and treatment of internal and external parasites was better as compared to tick born zoonosis. The knowledge of community was poor on actual cause of internal parasites with respect to concept of internal parasites' ova and their specific sources. Majority of farmers believed licking soil and putrefying roughage were the main sources of internal parasites in animals. Majority of livestock owning community perceive, debility and pot belly as core signs of internal parasites. As a treatment protocol for external and internal parasites; the farmers believed in acaricide dip and oral anthelmintic respectively, whereas, consultation from veterinarians for the right choice of medicines for the parasite control and treatment is above all. The Majority of respondents could not only, name any specific disease spread by ticks across animals and humans but their tick removal methods were also inappropriate. Therefore, there is a need to sensitize farmers with importance of tick born zoonosis, safe methods of tick removal and disposal from animals and the concept of ova as actual cause of internal parasite infestation.

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INTRODUCTION

In majority of underdeveloped countries, where literacy levels are very low, the livestock farmers are usually not properly equipped with requisite professional knowledge required to properly manage parasite infestation in their animals. In Pakistan, the literacy rate is 61.0% out of which 54.0% among females and 68.0% among males where its distribution among urban and rural areas is further compromised (Pakistan Bureau of statistics, 2025). Rural populations are mainly engaged in livestock keeping and most of the livestock in rural settings is of low to persistence level (Economic Survey of Pakistan, 2024). In such a scenario, the knowledge of livestock farmers is usually of traditional type based mostly on malpractices that usually harm the welfare of animals (Mkwanazi et al., 2021). The compromises in health and welfare of animals on account of poor management of animals lead to low productivity especially in dairy animals (Kumari et al., 2023). Therefore, in underdeveloped countries, there is an immense need to run awareness raising campaigns in order to sensitize livestock farmers with recent advances in disease prevention and control. An effective awareness campaign requires bench mark data regarding the knowledge, attitude and practices of stakeholders on disease treatment and control measures (Ayers et al., 2016). Improved awareness positively impacts the behavior of stakeholders improving health and welfare of animals including parasite control and prevention (Kumari et al., 2023). The improved health and welfare of animals bring better production and economic returns to farmers. Tick born zoonosis is another important aspect of animal management. Ticks can impact the welfare and health status of animals directly and indirectly by sucking blood and transfer of disease causing agents like viruses and other microorganisms. Most of the times the stakeholders especially in rural communities where literacy rates are low especially among livestock farmers ticks are found responsible for spreading zoonotic diseases like Congo fever on account of malpractices on removal and handling of ticks (Sadiq et al., 2021). The current study has been made as an effort in rural settings of District Okara; Tehsil Depalpur and Renala Khurd, Punjab province of Pakistan to provide bench mark information on prevailing knowledge, attitude and practices of livestock owning community towards endo and ectoparasites including ticks for their important role in zoonosis. The findings of this study may aid in development of more appropriate and need based awareness campaigns to raise the knowledge and improve the attitude and perceptions of livestock farmers towards better control of tick born zoonosis and control of internal and external parasitism in livestock.

MATERIAL and METHOD

Ethical Statement

The study did not involve any experimental procedures on animals. Sample collection was performed following standard welfare principles. Ethical approval was given by the Ethical Research Committee (ERC) of the Livestock Production Research Institute, Bahadurnagar Okara (Approval No: 05/20/2025/215/RRC).

Study Location

The current study was conducted in tehsil Depalpur and Renala khurd of District Okara, Punjab Pakistan. Okara is located 30° 48' 30.6000'' N and 73° 27' 33.8256'' E on the map of Pakistan at an altitude of 152.4 meters from sea level. The climate of city is warm and dry except the monsoon. During the hot months the temperature varies from 24-40 °C.

Data Collection

The data were collected (from May 2024 to August 2024) from seventy-two (72) livestock owners and managers both male (28) and females (44) in varying age groups from young age to elderly and literacy level ranged from illiterate to graduation and above. The data were collected through survey using a structured pretested open-ended questionnaire on their management practices towards tick zoonosis, endo and ecto-parasitism. The respondents were selected using snowball sampling technique from both the tehsils of district Okara and interviewed personally after informed consent.

Statistical Analysis

Collected data were analyzed using SPSS version 25.0 for frequencies and percentage analysis. The degree of association among parameters was estimated using Chi-square test at a significance level of $p \leq 0.05$.

RESULTS and DISCUSSION

Current survey was conducted in tehsil Depalpur and Renala khurd, district Okara, Punjab, Pakistan to record KAP of livestock farmers towards endo and ectoparasite infestation for identification and adopted treatment methods. The results are as given below.

Demographic Characteristics of Respondents

The demographic characteristics of respondents are summarized in Table 1. A total of 72 farmers were interviewed out of which 28 (38.9%) were male, whereas, 44 (61.1%) were females. The respondents were divided into different age groups; majority of the respondents were above 50 years of age, however, the teen age group (up to 19 years) was only 4.16%; whereas, 41.66% of the respondents were falling between the ages of 20 to 40 years in their respective age groups. In the age group above 60 years, only one respondent participated in the study. The respondents were also grouped with regard to the level of their education; majority of participants (91.4%) were up to 10th grade in local context matriculation out of which 28.78% were illiterates; 25.75% were only up to 5th grade. Only 2.7% of the respondents were graduate or above. More females participated in the study because among small holders of livestock, females mostly handle the livestock. Among different age groups; majority of the participants belonged to the age group of 40-50 years. In this age group the stakeholders are usually decision makers in local socioeconomic settings. The majority of respondents in current study were having low level of education as the current literacy rate in Pakistan is only 61.0% (Pakistan Bureau of statistics, 2025).

Livestock Farmers Believe Animals Suffer From Internal Parasite Infestation

The data presented in Table 1 revealed gender ($\chi 2= 1.50$ & $p= 0.207$) and education level ($\chi 2= 3.85$ & $p= 0.571$) of respondents not correlated with knowledge about parasite infestation, whereas, age was otherwise ($\chi 2= 13.59$ & $p= 0.018$). Among males and female majority 96.4% and 100.0%, respectively, believed in suffering of animals with internal parasite infestation. Data on different age groups revealed that from young age to adults (up to 50 years) 100.0% of the respondents believed susceptibility of animals to acquire endo parasite infestation. Among different education level groups; data shows that 100.0% of the respondents from illiterates to graduates believe in animals' likelihood of suffering from internal parasite infestation. Both, the education and gender of respondents are found to be insensitive to perception that animals are likely to suffer from internal parasite infestation.

The respondents in current study were all either owners or the active participants in the management of livestock having close liaison with animals. The observation of live worms and sharing of the observation by farmers may be the reason for their knowledge about the response variable. Dung is considered the most suitable source to diagnose internal parasite infestations by majority of (65.0%) of the farmers interviewed (Inacio et al., 2021; Halvarsson et al., 2022). The knowledge of parasites treatment and control in animals was positively correlated with formal education status of the farmers (Sazmand et al., 2020).

Table 1. Do the animals suffer internal parasite infestation?

Gender	n	%	Yes	No	χ^2	*p*-Value
Male	28	38.9	96.4	3.6	1.59	0.207
Female	44	61.1	100.0	0.0		
Age(years)						
up to 19	3	4.2	100.0	0.0	13.59	0.018
20-30	15	20.8	100.0	0.0		
31-39	15	20.8	100.0	0.0		
40-50	33	45.8	100.0	0.0		
51-60	5	6.9	80.0	20.0		
above 60	1	1.4	100.0	0.0		
Education						
Illiterate	19	26.4	100.0	0.0	3.85	0.571
Up to 5th	17	23.6	100.0	0.0		
6th to 9th	15	20.8	100.0	0.0		
Matriculate	15	20.8	93.3	6.7		
Intermediate	4	5.6	100.0	0.0		
Graduation & above	2	2.8	100.0	0.0		

Livestock Farmers Believe Eating Soil is Main Source of Entozoa in Animals

The data in Table 2 shows respondents' gender, age and education status were not correlated with knowledge on response variable (χ^2= 4.87 & p= 0.182, χ^2= 2.59 & p= 0.151 and χ^2= 23.62 & p= 0.072, respectively). Education level of respondents showed only a trend towards correlation with response variable. Eating of soil by animals was perceived to be the main source of getting internal parasite among gender 96.4% males and 61.1% females; among age groups the percentages ranged from 60.0%-100.0% in all groups (60.0%; 51-60 years); among education level groups the percentages ranged from 86.7 to 100.0% in all groups (86.7%; 6th to 9th school grade). Majority of the respondents believe eating of soil in any form is the main source of getting internal parasites by livestock. Parasites release their eggs in environment at different stages of their life cycles making soil an important reservoir of certain parasite ova especially when the soil comes in contact with contaminated sewerage water. Soil becomes a potential source of roundworm and other internal parasite ova when sewerage mixes with it (Omudu and Amuta, 2007; Acka, 2010).

Table 2. Source of entozoan infestation for livestock

Gender	n	%	SE	EPR	SE & EPR	DK	χ^2	*p*-Value
Male	28	38.9	96.4	0.0	0.0	3.6	4.87	0.182
Female	44	61.1	88.6	4.5	6.8	0.0		
Age(years)								
up to 19	3	4.2	100.0	0.0	0.0	0.0	2.59	0.151
20-30	15	20.8	100.0	0.0	0.0	0.0		
31-39	15	20.8	93.3	0.0	6.7	0.0		
40-50	33	45.8	90.9	6.1	3.0	0.0		
51-60	5	6.9	60.0	0.0	20.0	20.0		
above 60	1	1.4	100.0	0.0	0.0	0.0		
Education								
Illiterate	19	26.4	100.0	0.0	0.0	0.0	23.62	0.072
Up to 5th	17	23.6	94.1	5.9	0.0	0.0		
6th to 9th	15	20.8	86.7	6.7	6.7	0.0		
Matriculate	15	20.8	93.3	0.0	0.0	6.7		
Intermediate	4	5.6	75.0	0.0	25.0	0.0		
Graduation & above	2	2.8	50.0	0.0	50.0	0.0		

SE = soil eating EPR = eating of putrefying roughages DK = do not know SE&EPR = eating both soil and putrefying roughages

Farmer Unawareness on Concept of Presence of Parasitic Ova in Soil

Data on response variable in Table 3 showed gender was significantly correlated (χ^2= 12.51 & p= 0.002), whereas, age and education level were not correlated (χ^2= 11.39 & p= 0.32, χ^2= 8.67 & p= 0.564). Among male and female 78.6% and 36.4%, respectively, did not know about the concept of parasite ova. In different age groups; majority of farmers were unaware of entozoan ova concept 20.0% to 100.0% reported certain microorganisms' presence in soil, whereas, 46.7 to 80.0% reported unawareness of this concept. Similarly, among different education level groups; 25.0% to 100.0% reported presence of certain microorganisms, whereas, 35.3% to 75.5% in different categories reported unawareness on this concept. In the current study majority of respondents in all categories do not have idea of entozoan ova rather they perceive certain microorganisms in soil can grow into internal parasites when such soil is taken by animals. On contrary to the perceptions of respondents in current study, researchers traced parasite ova in contaminated soil and fecal samples of animals as potential source of infection (Omudu and Amuta, 2007; Halvarsson et al., 2022).

Table 3. What do the soil / sources contain actually transferring parasites among animals?

Gender	n	%	DK	Ent. ova	Micro-org.	χ^2	*p*-Value
Male	28	38.9	78.6	0.0	21.4	12.51	0.002
Female	44	61.1	36.4	4.5	59.1		
Age(years)							
up to 19	3	4.2	0.0	0.0	100.0	11.39	0.328
20-30	15	20.8	73.3	0.0	26.7		
31-39	15	20.8	46.7	0.0	53.3		
40-50	33	45.8	48.4	6.1	45.5		
51-60	5	6.9	80.0	0.0	20.0		
above 60	1	1.4	0.0	0.0	100.0		
Education							
Illiterate	19	26.4	63.2	0.0	36.8	8.67	0.564
Up to 5th	17	23.6	35.3	5.9	58.8		
6th to 9th	15	20.8	60.0	6.7	33.3		
Matriculate	15	20.8	53.3	0.0	46.7		
Intermediate	4	5.6	75.0	0.0	25.0		
Graduation & above	2	2.8	0.0	0.0	100.0		

DK = do not know, Ent. ova = eating of putrefying roughages, Micro-org. = microorganisms

Fecal samples are also reported as an important source of parasitic ova in dairy animals capable of transmitting parasites (Kahby et al., 2024). This lack of awareness may be on account of either lack of or inappropriate campaigns by relevant private and government sector stakeholders; improvement was observed in the knowledge of stakeholders by appropriately designed edutainment campaigns (Porcu et al., 2022).

Farmers Believe Debility and Pot Belly as Core Signs of Entozoan Infestation

Data on response variable in Table 4 showed no correlation with either of respondents' attribute, gender, age group or education level (χ^2= 6.94 & p= 0.543, χ^2= 31.87 & p= 0.817 and χ^2= 54.48 & p= 0.063 respectively), whereas education level showed only a trend of correlation. Males and females reported 7.1%, 53.6% & 25.0%, 34.1% debility and pot belly, respectively, as core signs of entozoan infestation in livestock. Respondents among different age groups reported debility and pot belly as core signs of entozoan infestation. From young to elderly age groups the respondents reported 66.7%, 60.0%, 33.3%, 33.3% and 40.0% pot belly in the animals as core sign of entozoan infestation. Respondents among different education levels (from illiterates to graduation & above) reported pot belly (52.6%, 35.3%, 40.0%, 46.7%, 25.0% and 0.0%, respectively) as core signs of entozoan infestation in livestock. In current study, the majority of respondents reported debility and pot belly as the core signs of entozoan infestation in animals.

Table 4. Farmer level identification of entozoan infestation for core clinical signs in animals

Gender	n	%	DK	Debility	Inapp.	2&3	Wk & UPF	pot belly	Diarrhea	5,6&7	Wk&LWF	χ^2	*p*-Value
Male	28	38.9	7.1	7.1	3.6	3.6	0.0	53.6	3.6	14.3	7.1	6.94	0.543
Female	44	61.1	2.3	25.0	2.3	4.5	2.3	34.1	4.5	20.5	4.5		
Age(years)													
up to 19	3	4.2	0.0	0.0	0.0	33.3	0.0	66.7	0.0	0.0	0.0	31.87	0.817
20-30	15	20.8	6.7	13.2	6.7	0.0	0.0	60.0	6.7	6.7	0.0		
31-39	15	20.8	6.7	13.3	0.0	0.0	0.0	33.3	0.0	33.3	13.3		
40-50	33	45.8	0.0	24.2	3.0	6.1	3.0	36.3	6.1	15.2	6.1		
51-60	5	6.9	20.0	20.0	0.0	0.0	0.0	40.0	0.0	20.0	0.0		
above 60	1	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0		
Education													
Illiterate	19	26.4	0.0	21.1	0.0	0.0	5.3	52.6	5.3	15.8	0.0	54.48	0.063
Up to 5th	17	23.6	5.9	23.5	0.0	5.9	0.0	35.3	5.9	23.5	0.0		
6th to 9th	15	20.8	0.0	6.7	6.7	0.0	0.0	40.0	6.7	20.0	20.0		
Matriculate	15	20.8	13.3	6.7	0.0	13.3	0.0	46.7	0.0	13.3	6.7		
Intermediate	4	5.6	0.0	75.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0		
Graduation & above	2	2.8	0.0	0.0	50.0	0.0	0.0	0.0	0.0	50.0	0.0		

K = do not know, Inapp. = inappetence, 2&3 = debility & inappetence, Wk & UPF = weakness & un-5,6&7 = wk & UPF, pot belly & diarrheai Wk&LWF = weakness & live worms in feces, digested feed particles in feces

Possible core signs and symptoms manifested by animals suffering parasitic loads include weakness, debility, pot belly and rough body coat (Foreyt, 2013; Elsheikha et al., 2018). This appropriate knowledge of respondents in current study may be an outcome of the extension services of relevant Government and private agencies on animal health and management in the area of study.

Farmers Prefer Modern Anthelmintic for Treating Internal Parasitism

Majority of farmers in current study reported the use of modern anthelmintic as sole agent for the treatment of internal parasitism (Table 5). Gender was significantly correlated with response variable, whereas age and educational level were not correlated (χ^2= 18.93 & p= 0.004, χ^2= 30.47 & p= 0.442 and χ^2= 34.45 & p= 0.263 respectively). The oral use of modern anthelmintic was advocated by 76.8% males and 29.5% females. Among different age groups from young to elderly 66.7%, 60.0%, 53.3%, 39.4%, 40.0% and 100.0%, respectively voted the oral use of modern anthelmintic as suitable treatment for internal parasitism. Among different educational level groups (from illiterates to graduation & above) 47.4%, 17.7%, 60.0%, 73.3%, 50.0% and 50.0%, respectively reported oral use of anthelmintic as effective method of internal parasitism. In current study, majority of the respondents believe in oral drenches of modern anthelmintic as an effective approach of treating internal parasitism in animals. When the animal owners were given a choice to select an anthelmintic, majority of them prioritized broad spectrum and potentiated dewormer against internal parasite infestation (Bebrysz et al., 2021). The reason for the choice of modern anthelmintic over traditional ethno veterinary products may be the extensive Government campaigns for deworming of animals with modern anthelmintic. Livestock and Dairy Development department, Punjab in the locality of current study has extensive network of service provision with a prime focus on extension services for raising awareness level of farmers and other stakeholders on animal management disease control.

Table 5. Farmer level treatment preferences for internal parasites

Gender	n	%	Sugar sol.	Vet cons.	MO	Jaggery	Anthelm.	3&4	4&5	χ^2	*p*-Value
Male	28	38.9	3.6	10.7	7.1	0.0	78.6	0.0	0.0	18.93	0.004
Female	44	61.1	20.5	11.4	22.7	4.5	29.5	4.5	6.8		
Age(years)											
up to 19	3	4.2	0.0	0.0	0.0	0.0	66.7	33.3	0.0	30.47	0.442
20-30	15	20.8	13.3	6.7	13.3	0.0	60.0	0.0	6.7		
31-39	15	20.8	26.7	13.3	0.0	0.0	53.3	0.0	6.7		
40-50	33	45.8	12.1	15.2	21.2	6.1	39.4	3.0	3.0		
51-60	5	6.9	0.0	0.0	60.0	0.0	40.0	0.0	0.0		
above 60	1	1.4	0.0	0.0	0.0	0.0	100.0	0.0	0.0		
Education											
Illiterate	19	26.4	10.5	21.1	15.8	5.3	47.4	0.0	0.0	34.45	0.263
Up to 5th	17	23.6	23.5	17.6	29.4	0.0	17.6	5.9	5.9		
6th to 9th	15	20.8	26.7	0.0	6.7	6.7	60.0	0.0	0.0		
Matriculate	15	20.8	0.0	0.0	13.3	0.0	73.3	6.7	6.7		
Intermediate	4	5.6	0.0	0.0	25.0	0.0	50.0	0.0	25.0		
Graduation & above	2	2.8	0.0	50.0	0.0	0.0	50.0	0.0	0.0		

Vet cons. = veterinarian consultation, MO = mustard oil, Anthelm. = anthelmintic drugs 3&4 = mustard oil & jaggery, 4&5 = jaggery & anthelmintics

Farmers Perceive; Ticks May Transmit Certain Diseases in Animals

In current study, the knowledge of farmers about disease transmission by ticks in animals showed that gender was correlated (χ^2= 26.21 & p= 0.000) whereas, age group and education level were not related Table 6, shows that 53.6% males were unaware of any disease caused by ticks in animals, whereas, 45.5% females believed ticks may cause certain disease in animals but they could not name that, 21.4% males and 52.2% females named that disease as tick fever. Among age groups majority of farmers could not name any specific disease (minimum 20.0% whereas maximum 66.7%) transmitted by ticks. Among different education level groups 53.3% of total farmers (6th to 9th grade; *n*=15) named that disease as tick fever, whereas 52.9% of the farmers (up to 5th grade; *n*=17) could not name any specific disease rather they did believe that some disease that they cannot name. Education level showed only a trend of association (p= 0.097). Gender was found to be significantly associated with knowledge of respondents regarding importance of ticks and tick-borne diseases.

Table 6. Farmers' knowledge about the diseases transmitted by ticks

Gender	n	%	DK	Tick fever	yes BCND	χ^2	*p*-Value
Male	28	38.9	53.6	21.4	25.0	26.21	0.000
Female	44	61.1	2.3	52.2	45.5		
Age(years)							
up to 19	3	4.2	0.0	33.3	66.7	6.89	0.736
20-30	15	20.8	33.3	26.7	40.0		
31-39	15	20.8	26.7	53.3	20.0		
40-50	33	45.8	18.2	39.4	42.4		
51-60	5	6.9	20.0	40.0	40.0		
above 60	1	1.4	0.0	100.0	0.0		
Education							
Illiterate	19	26.4	15.8	36.8	47.4	16.10	0.097
Up to 5th	17	23.6	5.9	41.2	52.9		
6th to 9th	15	20.8	53.3	33.3	13.4		
Matriculate	15	20.8	26.7	40.0	33.3		
Intermediate	4	5.6	0.0	75.0	25.0		
Graduation & above	2	2.8	0.0	50.0	50.0		

DK = do not know, BCND = but cannot name the disease

Stakeholders including livestock farmers were found well equipped with self-related knowledge on ticks as a potential source of infection across animals (Chakraborty et al., 2023). There was a strong perception among livestock farmers regarding the involvement of ticks in spreading tick bourn fever (theilerioses and piroplasmosis) in animals (Almazán et al., 2022; Valente et al., 2022; Abd-Elrahman et al., 2025).

Although farmers could not name any specific condition caused or spread by ticks yet they believe ticks are bad players among animals; the cause of compromised health and welfare (Chakraborty et al., 2023) leading to economic losses. In underdeveloped countries like Pakistan, the possible reason for this low level of knowledge on tick-borne diseases, may be the lack of proper awareness campaigns because the need based properly designed edutainment campaigns for awareness raising improved KAP of stakeholders on tick related diseases (Porcu et al., 2022).

Livestock Farmers Believe in Possible Tick Born Zoonosis

In current study, the knowledge of farmers on tick born zoonosis shows that gender was correlated (χ^2= 21.11 & p= 0.000) whereas age group and education level were not related with response (χ^2= 17.16 & p= 0.310 & χ^2= 20.58 & p= 0.151 respectively). Data in Table 7, shows that females were more aware than the males with regard to zoonotic capability of ticks (45.5%) who exactly named it Congo fever, whereas only 21.6% of males knew about it. Majority of males 71.4% were unaware of zoonic importance of ticks, whereas 34.4% females knew its zoonosis but could not knew the exact terminology used for its zoonosis.

Table 7. Knowledge of farmers on tick associated zoonosis

Gender	n	%	Dk	yes BCND	Congo Fever	DCA dis	χ^2	*p*-Value
Male	28	38.9	71.4	7.1	21.4	0.0	21.11	0.000
Female	44	61.1	18.2	34.1	45.5	2.3		
Age(years)								
up to 19	3	4.2	33.3	0.0	66.7	0.0	17.16	0.310
20-30	15	20.8	60.0	20.0	20.0	0.0		
31-39	15	20.8	53.3	0.0	46.7	0.0		
40-50	33	45.8	24.2	36.4	36.4	3.0		
51-60	5	6.9	40.0	40.0	20.0	0.0		
above 60	1	1.4	0.0	0.0	100.0	0.0		
Education								
Illiterate	19	26.4	36.8	26.4	36.8	0.0	20.58	0.151
Up to 5th	17	23.6	11.7	41.2	41.2	5.9		
6th to 9th	15	20.8	66.6	6.7	26.7	0.0		
Matriculate	15	20.8	53.4	13.3	33.3	0.0		
Intermediate	4	5.6	25.0	50.0	25.0	0.0		
Graduation & above	2	2.8	0.0	0.0	100.0	0.0		

DK = do not know, BCND = but cannot name the disease, DCA = do not cause any disease

Among age groups; the respondents in age group 31-39 years of age (*n*=15) 53.3% did not know any zoonotic importance, whereas 46.7% exactly knew the terminology of Congo fever. In age group 40-50 years of age 72.8% of respondents (*n*=33) believed in

the zoonotic importance of ticks. Among primary level education group of respondents (*n*=17) 82.4% knew about zoonotic importance of ticks whereas 11.7% were unaware of it. Among education level groups; 6th to 9th graders (*n*=15) 33.3% reported zoonosis awareness, whereas 66.6% were not aware of the zoonotic importance of ticks. Among matriculates 46.6% were aware of tick zoonosis whereas 53.4% did not know about it. In current study, the majority of livestock farmers were found to be unaware of the zoonotic importance of ticks although they had a perception for ticks as a vector for transmitting diseases in humans but most of the times, they could not name those specifically. Most of the times the animal owners were found unaware of zoonotic importance and specific diseases spread by ticks across animals and humans (Ricco et al., 2017; Sadiq et al., 2021). Among livestock owners a moderate level (54.0%) of knowledge on ticks and tick-borne diseases was observed (Chakraborty et al., 2023). The low level of knowledge on zoonotic diseases spread via ticks may be related with low literacy rate (Hundal et al., 2016) and lack of appropriate awareness campaigns or the campaigns run through inappropriate media with low outreach.

Inappropriate Methods of Tick Removal and Disposal by Farmers

Out of 72 livestock farmers' data on farmer level treatment options for ticks is presented in Table 8. The treatment options were not related with gender (χ^2= 8.92 & p= 0.063), age group (χ^2= 11.77 & p= 0.924) or level of education (χ^2= 12.85 & p= 0.884) except gender showed only a trend towards association.

Table 8. Farmer level treatment options for tick

Gender	n	%	RWoPnB	DK	Acd-Dip	Dis-Spry	Inj.S/C	χ^2	*p*-Value
Male	28	38.9	50.0	3.6	35.7	10.7	10.7	8.92	0.063
Female	44	61.1	36.4	0.0	47.7	2.3	13.6		
Age(years)									
up to 19	3	4.2	33.3	0.0	33.3	0.0	33.3	11.77	0.924
20-30	15	20.8	46.7	0.0	33.3	13.3	6.7		
31-39	15	20.8	40.0	0.0	53.3	0.0	6.7		
40-50	33	45.8	36.4	3.0	45.5	6.1	9.1		
51-60	5	6.9	80.0	0.0	20.0	0.0	0.0		
above 60	1	1.4	0.0	0.0	100.0	0.0	0.0		
Education									
Illiterate	19	26.4	47.4	0.0	26.3	10.5	15.8	12.85	0.884
Up to 5th	17	23.6	29.4	0.0	52.9	5.9	11.8		
6th to 9th	15	20.8	33.3	6.7	53.3	6.7	0.0		
Matriculate	15	20.8	53.3	0.0	40.0	0.0	6.7		
Intermediate	4	5.6	50.0	0.0	50.0	0.0	0.0		
Graduation & above	2	2.8	50.0	0.0	50.0	0.0	0.0		

DK = do not know, RWoPnB = removal without precautions: bare handed, Acd-Dip = acaricide dip, Dis-Spray = disinfectant spray, Inj.S/C = injection sub cut.

Majority of farmers among males and females (50.0% & 36.4%, respectively) advocated the removal of ticks with bare hands without taking any precautions, whereas, 35.7% males and 47.7% females believe acaricides dip is most suitable method of tick eradication. Among different age groups; majority of respondents felt no issue with removal of ticks without taking any disposable precautions (33.3%, 46.7%, 40.0%, 36.4%, 80.0% & 0.0%) and considered acaricides dip (33.3%, 33.3%, 53.3%, 45.5%, 20.0% &100.0%) as the most suitable method of tick eradication. Among different education levels; majority of respondents considered bare hand removal of ticks without taking any precautions (47.4%, 29.4%, 33.3%, 53.3%, 50.0% & 50.0%) and acaricides dip (26.3%, 52.9%, 53.3%, 40.0%, 50.0% & 50.0%) as the most suitable options for tick eradications. Majority of the farmers in current study perceived no harm in removing ticks without taking any precautions of disposable measures, whereas there is another majority among respondents who believe in acaricides solution dip as the most suitable methods of tick eradication in their livestock. Among livestock managing community, majority of them do not perceive removing ticks bare handed a possible risk to human health (Hussain et al., 2021). There is another larger proportion of livestock managing community believing in acaricides dip of animals as the most effective method of removing tick nuisance whereas minority of farmers were aware of progressive methods of tick removal. The possible reason to unawareness of safe methods of tick removal among the respondents of current study may be low level of literacy resulting in use of traditional practices of tick control.

CONCLUSION and RECOMMENDATIONS

Current study provides important information on KAP of livestock farmers and managers on tick born zoonosis, community led treatment and control methods for internal and external parasite infestation in animals in rural areas of underdeveloped countries like Pakistan. Results indicate a need to raise the awareness level of farmers towards tick bourn zoonosis, treatment and control of internal and external parasites in livestock through need-based campaigns by local government and private agencies. Reducing the load of parasites in animals will bring an improvement in animal health and welfare leading to better productivity and economic returns. The results of study are limited to the sample in the selected geographic area and may be replicated with caution. In future such studies should be replicated in same and new areas to evaluate any change in the KAP of livestock keepers on internal and external parasites.

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Conflict of Interest Statement

The respondents in current study who were either owner or the managers of livestock mainly dairy ruminants, they were interviewed through open ended survey questionnaire after taking informed consent. The survey questionnaire did not intervene with any religious or ideological restrictions in order to avoid any conflict.

Authors Contribution

Conceptualization: RYA and MS conceptualized the idea of current study including design and pretest of questionnaire. Data collection: SA and MS collected data from female respondents whereas RYA collected data from males. Statistical Analysis of data: RYA arranged, analyzed and explained the inferences from raw data. Editing of manuscript: RYA, AA and AH completed the write up and editing of manuscript.

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