Potential Factors and Physiological Biomarkers of Cross Bred Cattle Affected with Haemoprotozoan Infections in Dera Ismail Khan, Khyber Pakhtunkhwa –Pakistan

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ABSTRACT

The goal of this study was to assess the prevalence and probable factors of blood protozoa infections in hybrid cattle in the Dera Ismail Khan area, as well as their consequences on blood characteristics. A total of 500 blood samples were taken and analyzed using a blood microscope for this purpose. In conclusion the Taylor's disease was substantially more common in this location than other hematuria diseases in hybrid cattle. Physical condition, feeding method, and location were shown to be non-significant factors associated to the occurrence of infection, while age, sex, tick infection, and animal husbandry were revealed to be significant factors. The total number of white blood cells, haemoglobin concentration, compacted cell volume, total number of red blood cells, and blood index (average red blood cell volume, average red blood cell haemoglobin, and average red blood cell haemoglobin concentration) were all significantly lower, indicating macrocytic hypochromic anaemia, according to the results of the haematological examination. Due to a lack of data on the prevalence or current status of schistosomiasis infection in the Dera Ismail Khan region, this study contributes to the collection of information and the promotion of treatment and control strategies.

KEY WORDS: HEMOPROTOZOANS; CROSSBRED CATTLE; RISK FACTORS; HAEMATOLOGICAL PROFILE; DERA ISMAIL KHAN.

INTRODUCTION

Pakistan is an agricultural country with a large cow herd. The fact that 30 to 35 million rural Pakistanis engage in animal husbandry and get 30 to 40% of their income from livestock and dairy products shows just how important livestock is to the country's rural economy. Dairy and beef production contributed for 11.39 percent of the national economy and 58.33 percent of agricultural GDP, respectively (Pakistan Economic Survey 2016-17). Pakistan imports Holstein-Friesen and Jersey dairy cows for crossbreeding in order to improve the cow's

milk, meat, and skin output. Many diseases affect these exotic and hybrid cows include foot-and-mouth, liver and respiratory problems, mastitis, and blood protozoa disease. Anaplasmosis, Trypanosoma, and Babesia are all parasitic diseases that threaten the health and performance of cattle). You can observe these unusual cases of blood protozoal disease year-round. When it's hot and humid, disease outbreaks in exotic and hybrid cattle are more prevalent than in domestic cattle (Muhammad et al., 1999; Nasir et al., 2000; Rajput et al., 2005).

Many different types of insects, such as ticks and flies, transmit protozoa, such as the Hyalomma tick, *Dermatodes* fly, *Rhipicephalus* fly, *Boophilus* fly, *Haemaphysalis* fly, and *Ixodes* fly. Sand flies, on the other hand, transmit trypanosoma parasites. Hybrid cattle have a greater incidence of schistosomiasis than native cow breeds, and this schistosomiasis has resulted in significant losses in global animal husbandry. Due to the obvious causes of mortality, decreased profitability and reduced productivity

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of workers, they have significant financial consequences. Decastro (1997) estimates that blood protozoa and tick-borne diseases generate US\$1.4 to US\$190 billion in global economic harm each year (Unilenberg et al. 1995; Decastro, 1997; Ananda et al., 2009).

Tropical cattle theileriosis is caused by a small theileria, whereas East Coast fever is brought on by ring-shaped theileria. Anorexia, anemia, constipation, or bloody diarrhoea are all signs and symptoms of the disease. It is thought that the parasites *Anaplasma marginalis* and *Anaplasma centralis* are the cause of anaplasmosis. Constipation, fever, anorexia, dullness, depression, and anemia are some of the signs and symptoms of this disease. Babesiosis is the next kind of schistosomiasis that may be devastating for pet owners who keep tiny animals. A group of bacteria called Babesia are responsible for the illness. These bacteria include Babesia grandiflora, Bovis, and Diversiformis. An elevated rectal temperature, anemia, anorexia, and neurological issues are all signs of infection. Among Pakistani mixed cattle, trypanosomiasis is caused by *Trypanosoma Congo*, *Trypanosoma solani*, and *Trypanosoma brucei*. Another sign is severe anemic symptoms such as fatigue and loss of appetite, along with a high temperature and reduced productivity. Acute blood protozoal infection is diagnosed by clinical signs and Giemsa-stained blood smears. Hematology is primarily concerned with conveying information about poor health, production difficulties, and the robustness of cattle in general. As an indicator of the severity of the disease, hematological changes are an excellent diagnostic and prognostic tool (Rezaci and Naghadeh, 2006; Col and Uslu, 2007; Nazifi et al., 2010, Durrani et al. 2008; Atif et al., 2012).

MATERIAL AND METHODS

Study Area: The study took place in five different agro-ecological tehsils in the D.I. Khan district (Paroa, Daraban, Dera Ismail Khan, Paharpur, and Kulachi) (D.I. Khan). There are insufficient data on the prevalence of blood protozoa infection and its influence on host biomarkers in the research location.

Blood Microscopy: Random blood samples were taken from 100 hybrid cattle in D.I. Khan's urban and rural areas in EDTA-coated vaccination containers. The obtained samples are kept in a cold storage facility. On a clean microscope slide, a thin blood smear was formed and preserved with anhydrous methanol. The dyeing was done with the Giemsa staining process. After cleaning and drying the slides, examine them under a microscope for blood protozoa (Ullah et al., 2018).

Hematological Analysis: Hematology analysis blood samples are also utilized to analyses the impact of various infections on hematological parameters. Hemoglobin concentration (Hg), compacted cell volume (PVC), average red blood cell hemoglobin concentration (MCHC), total red blood cell count (TEC), total white blood cell count (TLC), average red blood cell volume (MCV), and average red blood cell volume (MCV) are

all determined using blood samples. Hemoglobin is a protein that carries oxygen throughout the body (MCH). The Hematology Analyzer (Abacus Junior Vet, Austria) of the University of Lahore Veterinary and Animal Science University Diagnostic Laboratory evaluated these blood samples (UDL).

Statistical Analysis: The prevalence of the disease is computed using the Thrusfield calculation (2002). The data of risk variables is assessed by statistical analysis using the chi-square test (χ^2), and hematological parameters are tested using the student's t test in SPSS.20 (IBM, Armonk, NY, USA).

RESULTS AND DISCUSSION

Table 1 indicates the overall prevalence of blood protozoa infection, with Taylor's illness being found in 3% (15/500) of blood samples, Babesiosis in 1.8 percent (9/500), and Trypanosomiasis in 0.8 percent (4/500). The current investigation found significantly more cases of Taylor's disease (P0.05) than other schistosomiasis infections, as previously described in indigenous studies (Ullah et al., 2018). This increased prevalence of Taylor's disease could be attributed to favourable variables like ticks that can transmit and complete the disease correctly.

Table 1. Prevalence of different hemoprotozoan infections in district Dera Ismail Khan, KP

Type of infection	Positive (%)	Prevalence	P-value
Theileriosis	15	3	0.031
Trypanosomiasis	4	0.8	
Babesiosis	9	1.8	

Blood samples from hybrid cattle infected with hematozoa was evaluated by a haematology analyzer using haematological parameters such as TEC, TLC, Hg, PCV, MCV, MCH, and MCHC. The average value of the positive blood protozoa animals' haematological parameters was compared to the average value of the normal haematological parameters from the Merck Veterinary Manual. Significant and non-significant relationships between several haematological parameters were investigated in this study. Total red blood cell count, total white blood cell count, haemoglobin concentration, compacted cell volume, average red blood cell haemoglobin, and average red blood cell haemoglobin concentration were reduced dramatically in this study, while average red blood cell volume did not. Hypochromic giant cell anemia was demonstrated by decreased TEC, TLC, HgB, PCV, and MCH but increased MCV. The extensive destruction of red blood cells by blood pear pulp in the acute stage of schistosomiasis, which leads to severe anemia, causes a decrease in HgB, PCV, and TEC. These findings was very comparable to those of Atif et al. However, the findings of Durany et

al. (2008) and Qayum et al. (2010) differ from those of Sandhu et al. (1998), who found that a decrease

in MCV and MCHC caused hybrid cattle to develop orthochromatic orthocytic anemia.

Table 2. Association of various factors with the occurrence of hemoprotozoan infections

Risk Factor	Determinants	No. of sample observed	Positive	Prevalence (%)	P-value
Age	Young	120	15	12.50	0.00
	Adult	194	4	2.06	
	Old	186	9	4.84	
Sex	Male	232	10	4.31	0.00
	Female	268	18	6.72	
Tick infestation	Present	258	19	7.36	0.00
	Absent	242	9	3.72	
Animal Keeping	Hygienic	210	04	1.9	0.00
	Unhygienic	290	24	8.28	
Body Condition	Poor	263	20	7.6	
	Good	237	08	3.38	
Feeding Pattern	Stall fed	266	17	6.39	
	Nomadic	234	11	4.70	
Location	Urban	250	11	4.40	
	Rural	250	17	6.80	

Table 3. Comparative effect of Hemoprotozoan infections on physiological biomarkers

Hematological Parameters	Babesia n=5	Theileria n=10	Anaplasma n=11	Trypanosoma n=2	Control healthy Mean±SE
TEC (106/ μ L)	6.39±.784 ^b	6.51±.564 ^b	5.42±.244 ^a	4.91±.89 ^b	8.33±1.666
TLC (103/ μ L)	4.79±.304 ^b	6.26±.624 ^b	5.91±.559 ^b	5.45±.755 ^b	8.00±2.309
HB (g/dl)	7.33±.835 ^b	6.82±.315 ^a	8.53±.40 ^b	9.00±2.00 ^b	11.00±2.081
PCV (%)	31.03±3.55 ^b	30.37±1.91 ^b	24.93±1.48 ^a	24.00±2.00 ^b	35.33±6.359
MCV (fl)	55.89±1.76 ^b	55.77±1.55 ^b	56.24±1.68 ^b	56.46±1.84 ^b	50.00±5.773
MCH (pg)	13.51±2.44 ^b	13.44±.896 ^b	13.4±.546 ^b	12.75±1.00 ^b	14.00±1.732
MCHC (g/dl)	20.11±.886 ^a	26.48±1.15 ^a	23.40±.971 ^a	21.92±2.42 ^a	33.00±1.732

All calves infected with the blood protozoa in this investigation developed anemia. The low average PCV values of all schistosomiasis-infected cattle suggest that schistosomiasis infection is the source of anemia. Because all blood protozoa cause red blood cell phagocytosis, hemolysis of red blood cells, which is frequent in all blood protozoa infections, causes anemia. According to Adejinmi et al. (2004), anemia can be used to better understand the severity of blood protozoa infections because the PCV value lowers in all blood protozoa infections.

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