Pathological Effects of Natural Babesiosis Infection: A Review

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ARTICLE HISTORY
Received: December 12, 2014
Revised: January 27, 2015
Accepted: March 16, 2015

Key Words:
Disease
Babesiosis
Lahore
Goats

CONTEXT
Babesiosis is a tick transmitted protozoal disease in most of the domesticated animal. It has negative impact over the production, weight gain and other parameters of the body. This review has some information about the pathological changes produced due to this infection in small ruminants. Bhat et al. (2014) conducted a study to determine the prevalence of Babesia infection in apparently healthy animals from the province of Punjab, India. Results of examination of thin blood smears confirmed 2.45% animals to be positive for piroplasmosis of B. bigemina while genomic DNA isolated from the blood samples when subjected to primary PCR showing a positivity of 7.38% was detected by the amplification of 278-bp product in the agarose gel. PCR products obtained from the primary PCR of B. bigemina, when engaged as template in nested PCR produced the amplicons of favored size (170 bp) was detected in 30.39% of the samples. Ijaz et al. (2013) studied the prevalence of Babesiosis in sheep and goats in district Lahore and its urban peri-urban regions was investigated the efficacy of three different treatments was measured. A total number of 630 blood samples, out of which
253 number of sheep and 377 goats were together randomly from suspected animals and observed microscopically. Babesiosis infection was found in 57 (23.46%) sheep, and 52 (13.57%) goats. RBCs, PCV, Hb and thrombocytes was found to be significantly decreased (p<0.05) while there were no significant changes on other blood parameters. Efficiency of imidocarb dipropionate with oxytetracycline and imidocarb dipropionate alone, On the other hand diminazene aceturate along with oxytetracycline and diminazene aceturate alone was 100, 80, 80 and 70 percent in sheep whereas in goats 100, 80, 90 and 70 percent against Babesiosis correspondingly, constructing imidocarb dipropionate along with oxytetracycline the utmost effective combination in both sheep and goats. Martellet et al. (2013) was observed to determine the clinical signs of Babesia and diagnosis of Babesiosis through PCR and Restricted Fragment Length Polymerase chain reaction. Canine Babesiosis is emergent tick-borne disease mainly caused by intra-erythrocytic protozoan of the genus Babesia. When the parasites on Infection complicated in dogs produced hemolytic syndromes that can be very fatal. Prevalence of canine Babesiosis in France is very high, so Babesia canis consideration to be the main causative agent of this disease in the area. Examination of canine Babesiosis was conducted in various districts of France from September 2006 to December 2007. They collected a total number of 837 cases and were reported by using questionnaire of multiple choices. Blood samples from 70 dogs were examined by using PCR and RFLP to recognize the exact cause of Babesiosis in dogs in all over France. The most well-known clinical signs reported were anorexia, lethargy and hyperthermia (102-104°F) along with pale mucous membranes, splenomegaly and modification of urine feature. Through the molecular technique PCR and RFLP examination showed that twenty-six out of the 70 blood samples (37%) prevalence was reported in different areas of France. The results of the study give an exact and accurate indication for more molecular studies to appraise the species and vectors concerned in the transmission of the disease in France. Shahzad et al. (2013) studied to determine the prevalence and detection of Babesia ovis through a molecular technique (PCR) in a Lohi sheep at Bahadurnagar Livestock station Okara. The prevalence was investigated in 200 specific sheep of different age and sex by PCR technique. For running this technique using primers of Bbo-F and Bbo-R, specific for a 549-bp fragment in B. ovis genomic DNA. The results shows that 32 animals were detected positive 16% prevalence were the number of sheep found positive for B. ovis with parasites respectively, through Polymerase chain reaction (PCR). Esmaeilnejad et al. (2012) determined the hematological and serological changes due to Babesiosis in infected ovine and caprine with Babesia ovis. Significant decrease in (Hb), (PCV), (MCV) and (MCHC) and a significant increase in WBCs were recorded in diseased animals. There was significant increase in total protein values, BUN, Creatinine, cholesterol, triglyceride, LDL, HDL level and there was significant decrease in albumin level. Fakhar et al. (2012) conducted this study to describe the prevalence of Babesiosis in sheep and cattle in Kurdistan, Iran. In this assessment 2642 domestic sheep were examined randomly sampled from 500 different herds in Kurdistan from July to September months respectively. Examination of thin blood smears were taken and then stained by Giemsa staining method and examine under a microscope. Out of these sheep samples Babesia species is investigated in 136 sheep by examination of direct blood smear. So the prevalence percentage of Babesiosis in sheep at Kurdistan was (2.13%) and Babesia ovis is the most prevalent spp. found in sheep. The prevalence of Babesia infection in sheep indicates the epizootic strength position of babesiosis in the province. Zulfiqar et al. (2012)
were conducted a study to determined the presence of Babesiosis disease in small ruminants in Punjab (Pakistan) and also observed its effect on hematological and serological parameters of animals. They were collected blood samples from 144 ruminants clinically infected with Babesiosis, in six districts in Punjab. The following blood parameters were examined hematology (glucose, hemoglobin) and serum (Cholesterol, ALT, AST and LDH) results showed that significant increase in the glucose and Hb concentration as well as also a significant increase in values of (Cholesterol, ALT, AST and LDH) of the young ones and the adult animals results also showed that 28 out of 144 animals, from 5 out of 6 sampling districts, formed the 542 fragment precise for Babesiosis. Iqbal et al. (2011) carried out a study the objective of their study was to find out the risk factor through PCR based molecular technique for the finding of Babesia species in small ruminant animals in Punjab Pakistan. Randomly collected 108 blood samples of which 41 sheep and 67 goats from different herds in 07 districts of the province of Punjab. A questionnaire was established to collect data from infected animals from herds. Results showed that 37 blood samples (34.31%) produce the DNA fragment specific for Babesia specie, by PCR magnification, Out of 37 samples 21 were sheep and 16 were goats. The prevalence of the disease was varied between 19 to 68% from district to district. As it was reported that male small ruminants have (p=0.009) and young animals under 01 year of age have (p=0.01) which were very much prone to the parasite. The results also confirmed that herds consist of more than 15 animals have (p=0.007), small ruminants of various species composed of (p=0.022), allied with dogs (p=0.003) and dogs having ticks on their bodies (p=0.011) were surrounded by the major risk factors for the spread of Babesiosis in sheep and goats. Ranjbar-Bahadori et al. (2012) were carried out a study to construct diagnosis and chemotherapy against Babesia infected animals. It is a tick borne disease with greatly reasonable fatalities in livestock production all over the world. A 400 suspected sheep blood samples were collected and analyzed to find out Babesiosis infection, RLB was sound mainly to identify B. ovis, B. motasi, B. crassa, and B. lintan. The blood samples was used to extract DNA amplified with a ordinary primer from 18S rRNA gene, concerning the differences in the length of nucleotides sequences of the (PCR) products obtained from Babesia spp, the PCR yield derived from Babesia spp. Were then screened out and analyzed by RLB. The RLB result showed that 29 samples out of 400 blood samples were positive for B. ovis. The order sequence analysis of one PCR product as a representative for other B. ovis positive PCR products confirmed the results of RLB. The result of the study showed that B. ovis could be considered as a leading causative agent of sheep Babesiosis in Iran, it also showed that RLB can be used as a reliable method for an instant isolation of Babesia species from other techniques. Sulaiman et al. (2010) was conducted a study to determined the clinical changes, and hematological and biochemical changes in blood of small ruminants due to Babesiosis. Examinations of 175 indigenous goats, out of these, 27 animals were infected with B. ovis and B. motasi (which was recorded in Mosul Iran for the first time) and in the same way 25 healthy animals were clinically served as a control. Their results showed that the percentage of the infection with Babesiosis was 15.50% and the proportion of parasitaemia ranged between 3.4-10.27% with a represent significance of 6.94%. The clinical signs of infected goats showed fever, weakness, loss of appetite, nasal discharge, jaundice, listlessness, recumbency, diarrhea, pale mucous membranes and hemoglobinuria, anemia, and hematological values showed a significant decreases i.e., red blood cells, hemoglobin
concentration, platelets counts and packed cell volume. While on the other hand a significant increase was recorded in erythrocyte sedimentation rate (ESR) and total white blood cells (WBC) values was recorded due to considerable increase in lymphocyte and neutrophils. However, results of the serological profile test indicated that increase in blood urea nitrogen (BUN), total serum protein, alanine amino transferase (ALT), total bilirubin, aspartate amino transferase (AST) and icterus index, with a significant decrease was observed in globulin levels and albumin. Study also examined that incidence of Rhipicephalus species ticks, which were Rhipicephalus sanguineus and Rhipicephalus turanicus. Rashid et al. (2010) was conducted to determined the efficacy of different drugs against Babesiosis infection and as well as their pathological effect on blood hematological parameters due to Babesiosis. A total 310 sheep blood samples were collected randomly in the neighboring herds of Sahiwal district. The blood samples were examined microscopically and results showed that 30 (9.65%) were positive for Babesiosis. The animals were divided into two groups i.e. (A and B) for chemotherapy. Group A sheep were treated with imidocarb while group B animals were treated with diminazene diacetate. Efficacy of drug was observed by negative blood smear examination. The results showed that Diminazene efficacy against Babesiosis was 80% where as that of imidocard dipropionate was 100%. Blood studies showed a significant decrease in hemoglobin (Hb) concentrations and hematocrit values for Babesia positive animals compared to healthy animals.

Ramos et al. (2010) was conducted a study to find out the causative agent of Babesia specie in White tailed-deer through PCR and (IFAT) in White-tailed deer in south Texas areas. A blood sample was collected from white-tailed deer in Webb and LaSalle areas were investigated for B. bovis microscopically and further confirmation by polymerase chain reaction to identify the Babesia from 18S rDNA. Results showed that B. bovis is a causative agent of white tailed-deer. Biochemical parameters were investigated from selected samples to recognize antibody activity to B. bovis by (IFAT). PCR revealed that 16.21% of the LaSalle areas samples and 4.81% of the Webb areas samples were positive for B. bovis in the County the B. bovis 18S rDNA Amplicons cloned and sequenced. Results showed that clones shared 99.0 % identity to B. bovis 18S rRNA gene sequences resulting from cattle extraction.

Chaudhry et al. (2010) studied that Babesiosis and other tick borne diseases are responsible for more than 50.0% losses in the cattle. Diagnosis of carrier animals in herd is vital for preventing outbreaks by transmission through vector ticks to healthy animals. Molecular detection of Babesia bovis and Babesia bigemina in carrier cattle were dignosed. For this study, randomly collected a total 100 number blood samples were analyzed by using microscopic examination and PCR. Screening through microscopy showed that 18% of samples were positive. While through PCR analysis of samples diagnosed 29% animals were positive, out of which 11% were positive for B. bovis and 18% for B. bigemina. However, 11% of the animals apparently healthy through routine light microscopy diagnosis were carriers posing threat for the healthy herd population.

Al-Saad. (2009) was conducted a study to investigate the Hematological and Serological values in naturally infected foal with Babesiosis. He collected a blood samples a total of 105 animals one to eight months old from both sexes and were examined, and it showed that 90 numbers of animals were naturally infected with Babesia caballi and Babesia equi. Results show that a significant increase in ESR and MCV were encountered in foal. Macrocytic hypochromic type of anemia was observed and the percentage of parasitaemia ranged
between 8.34% and also increases WBCs as increases in lymphocytes. The bio chemical changes showed that significant decrease in total protein and calcium level.

Guan et al. (2009) was carried out a study to observed morphology and pathogenicity of a large Babesia species. When the splenectomized sheep were immuno-suppressed by dexamethasone the infected sheep with the parasite then showed mild fever, low parasitemia and construct progress gradually the parasitemia could reached 8.51% and then finally leads to death. A splenectomized calf might not be infected with the Babesia species. The distinctive form of the Babesia species in erythrocytes and the normal size of a pair of parasites was 2.42 (±0.35) lm 1.06 (±0.22) lm. Merozoites were set up in the gut, salivary gland, ovary and eggs of *H. anatolicum, H. anatolicum* inflated on sheep infected with the parasites. The results of investigational spread showed that the nymph, larval and adult stages of *Hyalomma anatolicumma* could transmit the Babesia spp., to sheep in China.

Rahbari et al. (2008) was carried out a study that to determined the hemato-biochemical changes in Babesia infected animals, also studied the pathogenesis and clinical signs of *Babesia ovis* infection subsequently blood transfusion of infected blood to sheep with intact spleen and splenectomized sheep showed that all animals developed fever associated with a parasitaemia that were occurred within 2-4 days post-inoculation (dpi), clinical signs of disease were anemia, anorexia, listlessness, jaundice and hemoglobinuria. In intact animals, the hyperthermia then back to normal on the 4th day after the peak of pyrexia and parasitaemia was eliminated within the way of the disease in four cases. However, the parasitaemia reached a highest of 7.11% in splenectomized sheep 7-8 dpi; in ruminants with intact spleen, the parasitaemia was greatly lower and reached to a maximum of 1.0%. In both of the infected groups, the Hb concentration, red blood cell counts and hematocrit cut down shortly after the emergence of parasitaemia, reaching their lowest levels parallel with the peak parasitaemia. The total leukocyte counts were significantly decreased. In serum chemistry the total serum bilirubin levels of the infected group greater than the normal and peaked on 14-16 dpi; the rise in AST, blood urea nitrogen and Creatinine levels were insignificant. *B. ovis* severely affected the organs like kidneys and lungs. Infiltration of neutrophils, acute alveolar edema and macrophages in interstitial tissue were present, acute congestion, proliferative glomerulitis and stasis in glomerular capillaries and acute tubular focal necrosis were also present.

Aktas et al. (2007) reported that PCR was more sensitive technique for diagnosis of Babesia in small ruminants as compared to blood smear examination. His study in selected herds in some areas of Turkey showed that 1.50% sheep and goats were positive by microscopic examination while 8.25% were positive through PCR. Infectivity of *Babesia ovis* was found to be more in sheep (10.61%) as compared to goats (0.12%). All age groups were found to be equally prone to *Babesia ovis*. Herds having tick burden had higher rate of infection. Sequencing of the PCR amplicons were identical to the sequence of the previously reported *Babesia ovis*.

Sevinc et al. (2007) performed a study to evaluate the prophylactic, therapeutic efficacy of imidocarb dipropionate against *B. ovis* in experimentally infected lambs. The therapeutic group of splenectomized ovine that were given imidocarb dipropionate @ 1.2 mg kg\(^{-1}\) body weight became healthy after 48 h post-treatment. While the prophylactic group of splenectomized sheep that were given 2.4 mg kg\(^{-1}\) intramuscular injection had 66% and 83% success rate. Theodoropoulos et al. (2006) was carried out a study to diagnosed Babesiosis through clinical signs and molecular
technique PCR in sheep and goats. A total of 126 suspected animals of which 92 sheep and 34 numbers of goats blood samples was collected, which were selected randomly from 21 herds situated in two different areas of Greece. Information were collected on the basis (species, gender, tick burden, age, occurrence of hemoglobinuria, and earlier treatment for Babesiosis) and the herd (locality, size, dogs allied with the herds, tick burden of dogs linked with the herds) through questionnaires Performa, 19 ruminants (15%) formed the DNA portion specific for Babesia of which sixteen were sheep and 03 were goats. The PCR nucleotide order products revealed 100% of homology with B. ovis 18S rRNA gene. 09 farms (43.10%) were set up positive for B. ovis. The percentage of infected animals in each farm varied between 11.0 and 61.0%. The proficient risk of the prevalence of ticks in sheep, goats (p<0.01) and farm dogs were (p<0.01) for PCR positive result for B. ovis in sheep and goats was found 6.62% and 4.13% in the same way. Hosein et al. (2007) was observed the occurrence of B. ovis in small ruminants in Siwa Oasis. They collected randomly, 240 number of blood samples from 132 goats and 108 sheep. Primarily blood smear was prepared for examination and then separated blood serum and tested against B. ovis by using IFAT. Results showed that B. ovis was detected in 55 (50.91%) and 59 (44.70%) blood smears examined in sheep and goats, respectively. The overall prevalence of B. ovis infection was 71.6% in sheep and 68.3% in goat respectively by using immuno fluorescent antibodies test. The seasonal prevalence of B. ovis was peaked in both spring and summer as exposed by blood smear examination and immune-fluorescent antibodies test (IFAT).

Castella et al. (2006) Studied a different Electrolytes levels changes in the Serum due to different genus of Babesia spp. Electrolytes have a vital role in homeostasis. Serum samples from protozoan parasite infected West African Dwarf (WAD) positive sheep were investigated for electrolyte levels; Ca\(^{2+}\), K\(^+\), Na\(^+\), HCO\(_3^-\), Cl\(^-\) and PO\(_4^{3-}\). Irregular changes in the levels of these electrolytes were investigated in alone or coincident T. congolense or B. ovis infected West African Dwarf (WAD). Animals positive with B. ovis, the conclusion were chronic while in animals of (group II) infected with T. congolense effect was acute. Alternating changes were experimentally seen in single infection but absent in simultaneous infection. Intermittent changes was practically seen in single infections were alike but it is of short amplitude of difference in B. ovis infected WAD sheep. The considered values in T. congolense positive ones were significant changes in the levels of Ca\(^{2+}\), K\(^+\), Cl\(^-\), Na\(^+\), HCO\(_3^-\) and PO\(_4^{3-}\) were (p<0.05) in both of the infections with the exception that Ca\(^{2+}\) remains constant in single infections. Ahmad et al. (2005) conducted a study and the objective of their study was to record the seasonal prevalence in canines mainly in dogs, came at the Pet Centre, in (UVAS) Lahore Pakistan. As Babesiosis is a seasonal disease so the period of the study was started from January to December. The blood samples were together from the tip of the ear and formed a thin blood smears stained with Giemsa stain, after examination the slides under a microscope. The study showed that percentage of infectivity was at peak during the summer and autumn months. The overall number of percentage was 54.2 % 1.29%, 172.2 %3.23%, 75.1 % 2.13% and 13 % 0.53%, during spring, summer and autumn and winter season in the same sequence.

REFERENCES


