CLINICO-EPIDEMIOLOGY AND THERAPEUTICAL TRIALS ON BABESIOSIS IN SHEEP AND GOATS IN LAHORE, PAKISTAN


Department of Clinical Medicine and Surgery; *Department of Epidemiology and Public Health; University of Veterinary and Animal Sciences Lahore, 54000, Punjab, Pakistan; **Department of Epidemiology & Public Health, University of Salford, Manchester, United Kingdom; ***King Edward Medical University, Lahore ****University College of Veterinary & Animal Sciences, Islamia University of Bahawalpur

Corresponding author’s email: mijaz@uvas.edu.pk

ABSTRACT

The prevalence of babesiosis in sheep and goat in Lahore and its peri-urban areas was investigated and the efficacy of three different treatments was measured. A total of 620 blood samples (n=243 sheep; n=377 goats) were collected and examined microscopically. Babesia infection was found in 57(23.46%) sheep and 51(13.53%) goats. Haemoglobin (Hb), packed cell volume (PCV), red blood cells (RBCs) and thrombocytes were found to be significantly decreased (P<0.05) while there was no effect on other blood parameters. Efficacy of imidocarb dipropionate along with oxytetracycline, imidocarb dipropionate alone, 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 babesia respectively, making imidocarb dipropionate along with oxytetracycline the most effective combination in both sheep and goats.

Key words: Hb; RBCs; Babesia; Imidocarb dipropionate; Diminazene aceturate.

INTRODUCTION

Babesiosis is a disease of economic importance which inflicts significant losses to small ruminants production potential in tropical and subtropical regions of the world (Mehlhorn and Shein, 1985). Babesiosis is the third most important disease of sheep in Pakistan from an epidemiological point of view (Anonymous, 1994-95). Babesiosis is a haemoparasitic disease of domestic and wild animals. Babesia spp. is tick-borne apicomplexan parasites which infect a wide range of vertebrate hosts. The Babesia spp. are transmitted by hard ticks (family: Ixodidae) and animals develop fever concurrent with parasitemia within 2 to 4 days; the clinical signs of the disease are severe and include varying degrees of anorexia, listlessness, anemia, moderate jaundice and hemoglobinuria (Rahbari et al., 2008). Chronically infected sheep are usually symptomless, except for parasitemia and unthriftiness (Kimberling et al., 1988). Diagnosis of piroplasmosis in small ruminants is mainly based on the microscopic examination of Giemsa-stained blood smears and clinical symptoms (Aktas, 2007). Babesia ovis and Babesia motasi are known to be pathogenic in sheep and goats (Soulsby, 1986). The effects of B. ovis are usually less severe than B. motasi (Morel, 1989). Mixed infection with B. ovis and B. motasi is a highly-pathogenic disease syndrome in sheep (Rafyi and Maghami, 1966). Keeping in view the economic losses rendered by babesiosis, the present study was conducted to describe the prevalence of babesiosis, clinical features, chemotherapy and effect on various blood parameters in sheep and goats.

MATERIALS AND METHODS

Experimental design: A total of 620 animals (n=243 sheep; n=377 goats) of all age groups and both sexes, which were brought at outdoor teaching hospital, University of Veterinary and Animal Sciences and various Govt. and private hospitals in urban and peri-urban areas of Lahore during August 2010 to November 2010, were included in the study. Thin blood smears were prepared from all sheep and goats, brought to the above mentioned hospitals, by taking one drop of blood from the ear tip after proper disinfection of the area. The smears were air-dried, fixed in methanol and stained with 10% Giemsa stain. The slides were examined with an oil immersion lens at a total magnification of 1000x. Prevalence of babesiosis was calculated as per formula described by Thrusfield (2002).

Haematological Examination: For this purpose 5 ml blood sample was collected directly from the jugular vein of sheep and goats, infected with Babesia, into sterilized plastic bottles coated with EDTA @ 1 mg/ml of blood. Haematological examination was carried out by using haematological analyzer.

Therapeutic Trials: A total of 80 animals (n=40 sheep and n=40 goats) positive for babesiosis, were divided into four groups A, B, C and D, each group comprised of 20 animals (n=10 sheep; n=10 goats). The animals of group A were treated with imidocarb dipropionate (Imizol®,
ICI, Pakistan) @ 2 mg/kg BW i.m. plus oxytetracycline
@ 10 mg/kg BW i.m., group B was treated with
imidocarb dipropionate (Imizol®, ICI, Pakistan) @ 2
mg/kg BW i.m. alone, group C was treated with
diminazene aceturate (Fa-tray.banil; Prix Pharma,
Pakistan) @ 3.5 mg/kg BW i.m. and oxytetracycline @
10 mg/kg BW i.m. while group D was treated with
diminazene aceturate (Fa-tray.banil; Prix Pharma,
Pakistan) @ 3.5 mg/kg BW i.m. alone. Efficacy of drugs
was measured through recovery rate of the animals on the
basis of disappearance of clinical signs and negative
blood smear examination at day 2, 4, 6 and 10 post-
medication.

Statistical Analysis: Data on prevalence of babesiosis
was analyzed by Pearson’s chi-square test for
significance whereas data on clinical signs was analyzed by
Non-parametric, Chi-square test for proportion while
data on haematology was analyzed by independent
sample T-test using statistical software package STATA
9.1 (College Station Tx77845, USA). P < 0.05 was
considered significant.

RESULTS AND DISCUSSION

Data on prevalence of babesiosis, clinical signs, haematology and therapeutic trials in sheep and goats are
shown in table 1, 2, 3 and 4, respectively. The overall
prevalence of babesiosis in sheep and goat was 17.42
percent while prevalence was 23.46 and 13.53 percent in
sheep and goats respectively. The results of the present
study are completely in line with the findings of Razmi et al., 2003, who examined 391 sheep and 385 goats, and
reported prevalence in sheep and goats 26.1 and 14.8
percent respectively. Similarly the findings of the present
study are broadly consistent with karatepe et al., 2003
who reported 23.63 percent ovine babesiosis. Month wise
prevalence was also calculated and found highest
prevalence during the month of August which is
congruent with the findings of Yeruham et al., 1998.
They reported the highest prevalence of babesiosis in
August (56%), corresponding to the most active season of
the adult vector ticks because there is strong correlation
between infection of Babesia and presence of ticks. High
rise of body temperature, anorexia, dyspnea, haemoglobinurea, emaciation, pale mucus membrane, jaundice, constipation and recumbency were the main
clinical signs in both sheep and goats. The results
correlate with the findings of Sulaiman et al., 2010, who
reported that clinically infected goats showed different
signs graduated from loss of appetite, emaciation, pale
mucous membranes, jaundice, fever, coughing, nasal
discharge, recumbency and haemoglobinurea.

Results of the present study showed significant
decrease (P<0.05) in Hb, PCV, RBCs, thrombocytes and
WBCs count in the infected sheep as compared to healthy
sheep, while in goats Hb, PCV, RBCs and thrombocytes
count were significantly decreased (P<0.05) with non-
significant (P>0.05) effect on WBCs count. The study
 correlates with the findings of Rahbari et al., 2008, who
reported that haematological values in animals infected
with B. ovis were significantly different in most of the
cases. RBCs, haematocrit and haemoglobin values clearly
suggested that anemia was almost a constant
characteristic of the infection. Similarly, Baby et al.,
2001 and Yeruham et al. 1998, reported significant
decrease in Hb concentration and RBCs count resulting in
severe anemia which might be due to destruction of
RBCs by Babesia. The present results also agree with the
findings of Voyvoda et al., 1997 and Banerjee et al.,
1987 who reported decreased Hb concentration in sheep
and goats, respectively.

The combination of imidocarb dipropionate and
oxytetracycline was the most effective treatment regime
of babesiosis in sheep and goats followed by combination
of diminazene aceturate with oxytetracycline. These
results are in agreement with those of Ramin, 2000 and
McHardy et al., 1986, who recorded 97.28% and 100%
imidocarb efficacy respectively while treating sheep with
babesiosis. Similarly, Banerjee et al., 1987 and Rao et al.,
1989 reported diminazene to be an effective drug against
ovine babesiosis.

Table 1. Month wise prevalence of babesiosis in sheep and goats

<table>
<thead>
<tr>
<th>Months</th>
<th>Sheep</th>
<th>Goats</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of animals examined</td>
<td>No. of animals infected</td>
</tr>
<tr>
<td>August</td>
<td>48</td>
<td>35</td>
</tr>
<tr>
<td>September</td>
<td>59</td>
<td>13</td>
</tr>
<tr>
<td>October</td>
<td>63</td>
<td>05</td>
</tr>
<tr>
<td>November</td>
<td>73</td>
<td>04</td>
</tr>
<tr>
<td>Total</td>
<td>243</td>
<td>57</td>
</tr>
</tbody>
</table>

Chi-square test for significance analysis showed significant difference ($P<0.05$) in prevalence of babesiosis in different months in both sheep and goats.

---

Table 2. Haematological values of healthy and Babesia positive sheep and goats (Mean ± S.E)

<table>
<thead>
<tr>
<th>Haematological Parameters</th>
<th>Sheep Infected Mean±S.E</th>
<th>Sheep Healthy Mean±S.E</th>
<th>Goat Infected Mean±S.E</th>
<th>Goat Healthy Mean±S.E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hb g/dl</td>
<td><strong>6.36±0.30</strong></td>
<td><strong>12.43±0.31</strong></td>
<td><strong>06.75±0.09</strong></td>
<td><strong>10.38±0.26</strong></td>
</tr>
<tr>
<td>PCV %</td>
<td><strong>25.3±0.91</strong></td>
<td><strong>35.5±1.16</strong></td>
<td><strong>27.3±0.51</strong></td>
<td><strong>30.6±0.74</strong></td>
</tr>
<tr>
<td>RBC (x 10⁶/µl)</td>
<td><strong>6.2±0.33</strong></td>
<td><strong>12.0±0.39</strong></td>
<td><strong>05.4±0.10</strong></td>
<td><strong>13.4±0.40</strong></td>
</tr>
<tr>
<td>Thrombocytes (x 10³/µl)</td>
<td><strong>270±19.55</strong></td>
<td><strong>500±31.59</strong></td>
<td><strong>296±16.14</strong></td>
<td><strong>440±21.65</strong></td>
</tr>
<tr>
<td>WBC (x 10³/µl)</td>
<td><strong>12.5±0.45</strong></td>
<td><strong>07.0±0.47</strong></td>
<td><strong>08.1±0.40</strong></td>
<td><strong>08.10±0.64</strong></td>
</tr>
<tr>
<td>Neutrophils (x 10⁹/L)</td>
<td><strong>03.41±0.22</strong></td>
<td><strong>03.29±0.38</strong></td>
<td><strong>04.49±0.27</strong></td>
<td><strong>04.65±0.42</strong></td>
</tr>
<tr>
<td>Lymphocytes (x 10⁹/L)</td>
<td><strong>05.10±0.45</strong></td>
<td><strong>05.50±0.50</strong></td>
<td><strong>05.30±0.47</strong></td>
<td><strong>05.70±0.47</strong></td>
</tr>
<tr>
<td>Monocytes (x 10⁹/L)</td>
<td><strong>0.145±0.04</strong></td>
<td><strong>0.29±0.07</strong></td>
<td><strong>0.249±0.06</strong></td>
<td><strong>0.27±0.05</strong></td>
</tr>
<tr>
<td>Eosinophils (x 10⁹/L)</td>
<td><strong>0.067±0.02</strong></td>
<td><strong>0.56±0.06</strong></td>
<td><strong>0.341±0.07</strong></td>
<td><strong>0.38±0.06</strong></td>
</tr>
</tbody>
</table>

* indicates significant difference (p<0.05) among healthy and infected groups, by independent sample t-test.

* indicates non-significant difference (p>0.05) between healthy and infected groups, by independent sample t-test.

Table 3. Clinical signs observed in sheep and goats infected with Babesia

<table>
<thead>
<tr>
<th>Clinical Signs</th>
<th>Sheep n=57</th>
<th>Percentage</th>
<th>Goats n=51</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>High rise of temperature ( &gt;105°F)</td>
<td>55</td>
<td>96.49</td>
<td>46</td>
<td>90.20</td>
</tr>
<tr>
<td>Pale mucus membrane</td>
<td>52</td>
<td>91.23</td>
<td>44</td>
<td>86.27</td>
</tr>
<tr>
<td>Anorexia</td>
<td>50</td>
<td>87.72</td>
<td>35</td>
<td>68.63</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>48</td>
<td>84.21</td>
<td>34</td>
<td>66.67</td>
</tr>
<tr>
<td>Haemoglobinuria</td>
<td>47</td>
<td>82.46</td>
<td>31</td>
<td>60.78</td>
</tr>
<tr>
<td>Emaciation</td>
<td>22</td>
<td>38.60</td>
<td>26</td>
<td>50.98</td>
</tr>
<tr>
<td>Jaundice</td>
<td>21</td>
<td>36.84</td>
<td>23</td>
<td>45.10</td>
</tr>
<tr>
<td>Constipation</td>
<td>11</td>
<td>19.30</td>
<td>12</td>
<td>23.53</td>
</tr>
<tr>
<td>Recumbency</td>
<td>05</td>
<td>08.77</td>
<td>04</td>
<td>07.84</td>
</tr>
<tr>
<td>Ticks</td>
<td>35</td>
<td>61.40</td>
<td>22</td>
<td>43.14</td>
</tr>
</tbody>
</table>

Non-parametric, Chi-square test for proportion= 88.62, p-value 0.0000
56.68, p-value = 0.0000
P-value 0.764

Table 4. Comparative efficacy of various drugs against babesiosis at different days in sheep and goats

<table>
<thead>
<tr>
<th>Groups</th>
<th>Drug used</th>
<th>2nd day Sheep n=10</th>
<th>2nd day Goat n=10</th>
<th>4th day Sheep n=10</th>
<th>4th day Goat n=10</th>
<th>6th day Sheep n=10</th>
<th>6th day Goat n=10</th>
<th>10th day Sheep n=10</th>
<th>10th day Goat n=10</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Imidocarb dipropionate + Oxytetracycline</td>
<td>80</td>
<td>80</td>
<td>100</td>
<td>90</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>B</td>
<td>Imidocarb dipropionate</td>
<td>70</td>
<td>60</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>C</td>
<td>Diminazine aceturate + Oxytetracycline</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>D</td>
<td>Diminazine aceturate</td>
<td>40</td>
<td>30</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>60</td>
<td>70</td>
<td>70</td>
</tr>
</tbody>
</table>

It is concluded that babesiosis in sheep and goats is of considerable importance in the study area along with significant decrease in Hb concentration, PCV, RBCs and thrombocytes count whereas the combination of imidocarb dipropionate and oxytetracycline is the most effective treatment.

REFERENCES

Anonymous, (1994-95). Epidemiology of Major Livestock Diseases in Pakistan. Pakistan Agricultural Research Council (PARC), Islamabad and College of Veterinary Sciences,


