A study on the prevalence of Babesiosis in north eastern agro-climatic zone of Tamil Nadu, India

Vetrivel D, A Serma Saravana Pandian, KN Selvakumar and J Shilpa Shree

Abstract
The study was conducted to assess the prevalence of babesiosis in cattle farms. The data were collected from 120 sample cattle owners selected from 6 blocks in 3 districts of North east zone of Tamil Nadu viz. Kancheepuram, Tiruvannamalai and Vellore districts. The collected data were analysed by conventional percentage and average analysis, measure of disease occurrence and chi square analysis to achieve the objectives of the study. A total of 60 babesiosis affected cattle farms were studied. The results of the study indicated that the overall prevalence of babesiosis was 20.27 percent. The prevalence of babesiosis in Kancheepuram, Tiruvannamalai and Vellore districts was 18.52, 23.26 and 19.61 percent, respectively. The overall mortality and case fatality rate in babesiosis was 3.38 and 16.67 percent in babesiosis. There was a significant association between acaricide application and prevalence of babesiosis. Thus, the losses due to this diseases in cattle could be prevented by application of scientific management practices and control over these predisposing factors. Further lack of knowledge to manage the diseased animals had resulted in avoidable economic losses. Thus, the appropriate policy suggestions have to be made to control of babesiosis in cattle and minimise the economic losses due to this disease.

Keywords: Babesiosis, prevalence, mortality and case fatality rates

1. Introduction
India has huge livestock population especially cattle (199.08 million), which accounts for 37.58 percent of the total livestock population. Livestock capital is a very important element of the overall capital stock of world agriculture [1]. In India the livestock sector contribution is nearly 3.9 percent of total GDP and 25.85 percent of agriculture and allied activities. On the other hand, the dairy sector has been withstanding the vagaries of weather and has sustained a growth of around 4.51 percent per annum. It is estimated that during the year 2011-12, the gross value of output from livestock sector, at current prices was INR 4,59,051 crores out of which milk and milk products were INR 3,05,484 crores and the meat was INR 83,641 crores [2]. Despite the advantages it offers to vulnerable poor farmers in areas of socio-economic hardships, dairy cattle rearing suffer from inherent constraints. Among the constraints, diseases pose a more serious threat to cattle production. In case of an intensive farming system, tick borne diseases are a major threat. An animal disease outbreak would have serious economic impact on producers. Babesiosis is the common diseases frequently encountered in India resulting greater economic loss [3]. Babesiosis, is a febrile, tick-borne disease of cattle and buffalo, caused by one or more protozoan parasites of the genus Babesia which is generally characterized by high fever (41-45.5 °C) followed by anorexia, increase in respiratory and heart rate, anaemia, jaundice, haemoglobinuria, either constipation or diarrhoea, weight loss, abortion in pregnant animals, nervous symptoms in calves, coma and death [4]. Bovines are highly prone to tick borne diseases which is indirectly cause huge economic loss to farmers. There are hardly a few studies exist in the research literature focusing on the impact of these diseases in creating an economic loss. Taking into account by what has been said so far through discussions, it is felt that it is necessary to evaluate the economic impact caused by babesiosis.

2. Materials and methods
For the present study, Kancheepuram, Tiruvannamalai and Vellore districts of North eastern zone of Tamil Nadu were purposively selected. Since these districts have a unique blend of milk shed, cattle population and high incidence of tick borne diseases like Babesiosis among...
the cattle. From each of the selected districts, two blocks were selected by simple random sampling and from each block five villages were selected by simple random sampling and from each village, four cattle farms with the incidence of babesiosis were selected. Thus a total sample size for the study is 120 farms. The period of the study is from December 2013 to March 2014. The primary data for the study was collected through a well-structured pre-tested interview schedule. The collected data were analysed by conventional percentage and average analysis, measure of disease occurrence Prevalence, Mortality rate, Case fatality rate and chi square analysis to achieve the objectives of the study.

2.1 Prevalence

Prevalence refers to number of instances of disease or related attribute in a known population at designated time without distinction between old and new cases. Prevalence is usually expressed in terms of the number of diseased animals in relation to animals in the population, which are on the onset of developing stage of diseases. Prevalence can take the values of 0 and 1 and it is dimensionless. Sometimes it is expressed as a percentage.

\[
\text{Prevalence} = \frac{\text{Number of individuals having a disease at particular point of time}}{\text{Number of individuals in population at risk at that point of time}}
\]

2.2 Mortality rate

Mortality rate possess three essential elements, which are as follows; (a) a specifically defined population group (denominator), (b) the time period, and (c) the number of deaths occurring in population group during that time period (numerator). The numerator comprises the number of deaths and the animals that develop disease are included in the denominator (until they die).

\[
\text{Mortality rate} = \frac{\text{Number of death due to disease that occur in a population during particular point of time}}{\text{All animals at risk of dying}}
\]

2.3 Case fatality rate

Case fatality rate is the number of death occurred due to a specified disease in a specified population during a specified time period, divided by the number of cases of that particular disease in that population during that period of time.

\[
\text{Case fatality rate} = \frac{\text{Number of death}}{\text{Total number of animals affected with that disease}}
\]

2.4 Testing independence of factors

Chi-square analysis ($\chi^2$) was used to test the Hypothesis, $H_i$: The factors are independent.

\[
\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e}
\]

Where, $\chi^2$ = Chi-square statistic
$f_o$ = Observed frequency
$f_e$ = Expected frequency
$N$ = Number of observation

The decision rule: reject $H_0$ if $\chi^2 > \chi^2 \cdot (K-1)$, where, $\alpha$ is the level of significance and $K-1$ is the degrees of freedom.

3. Results and discussion

3.1 Prevalence of bovine babesiosis

The overall prevalence of babesiosis in cattle in the study area is presented in Table 1. The overall prevalence of babesiosis was 20.27 percent and the prevalence of babesiosis in the study area was lower (27.50 percent) than the study conducted by Shams et al. [3], but higher than (10.41 percent) the study carried out by Vahora et al. [6].

Table 1: Prevalence of babesiosis in cattle in the study area (in numbers)

<table>
<thead>
<tr>
<th>Diseases</th>
<th>Sample farms</th>
<th>Total number of cattle studied</th>
<th>Number of cattle affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Babesiosis</td>
<td>60</td>
<td>296 (100.00)</td>
<td>60 (20.27)</td>
</tr>
</tbody>
</table>

(Figures in parentheses indicate percentage to respective total)

3.2 District wise prevalence of babesiosis

Table 2 presents the district wise prevalence of babesiosis in the study area. The estimated prevalence of babesiosis in Kancheepuram, Tiruvannamalai and Vellore districts was 18.52, 23.26 and 19.61 percent, respectively. The prevalence of babesiosis was higher in Tiruvannamalai district followed by Vellore and Kancheepuram districts. *Boophilus microplus* was reported to be the most common tick species infesting cattle in southern region of the country particularly in Tamil Nadu [7]. The abundance of biting flies (*Tabanus* spp. and *Stomoxys* spp.) due to the hot and humid tropical climatic conditions prevailing in the state might also augment the mechanical transmission of the disease to newer animals [8].

Table 2: District wise prevalence of babesiosis among the sample farms (in numbers)

<table>
<thead>
<tr>
<th>Districts</th>
<th>Affected</th>
<th>Non-affected</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kancheepuram</td>
<td>20 (18.52)</td>
<td>88 (81.48)</td>
<td>108 (100.00)</td>
</tr>
<tr>
<td>Tiruvannamalai</td>
<td>20 (23.26)</td>
<td>66 (76.74)</td>
<td>86 (100.00)</td>
</tr>
<tr>
<td>Vellore</td>
<td>20 (19.61)</td>
<td>82 (80.39)</td>
<td>102 (100.00)</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td><strong>60 (20.27)</strong></td>
<td><strong>236 (79.73)</strong></td>
<td><strong>296 (100.00)</strong></td>
</tr>
</tbody>
</table>

(Figures in parentheses indicate percentage to respective total)
3.3 Mortality and Case fatality rate due to babesiosis in the study area

Table 3 presents the mortality rate due to babesiosis affected animals in the study area. The mortality rate in babesiosis was found to be 5.56 percent, 4.06 percent and 2.58 percent in small, medium and large farms respectively, with the overall rate being 3.38 percent.

Table 3: Mortality rate due to babesiosis in the study area (in numbers)

<table>
<thead>
<tr>
<th>Farm size</th>
<th>Babesiosis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Number of cattle</td>
<td>Number of cattle died</td>
</tr>
<tr>
<td>Small</td>
<td>18 (100.00)</td>
<td>1 (5.56)</td>
</tr>
<tr>
<td>Medium</td>
<td>123 (100.00)</td>
<td>5 (4.06)</td>
</tr>
<tr>
<td>Large</td>
<td>155 (100.00)</td>
<td>4 (2.58)</td>
</tr>
<tr>
<td>Overall</td>
<td>296 (100.00)</td>
<td>10 (3.38)</td>
</tr>
</tbody>
</table>

(Figures in parentheses indicate percentages to the respective total)

The details of case fatality rates due to babesiosis among affected cattle are presented in Table 4. The case fatality rate due to babesiosis among affected cattle was 11.11, 16.12 and 20.00 percent in small, medium and large farms respectively, with an overall fatality rate of 16.67 percent.

Table 4: Case fatality rate due to babesiosis in the sample farms of the study area (in numbers)

<table>
<thead>
<tr>
<th>Size of farms</th>
<th>Babesiosis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of cattle affected</td>
<td>Number of cattle died</td>
</tr>
<tr>
<td>Small</td>
<td>9 (100.00)</td>
<td>1 (11.11)</td>
</tr>
<tr>
<td>Medium</td>
<td>31 (100.00)</td>
<td>5 (16.12)</td>
</tr>
<tr>
<td>Large</td>
<td>20 (100.00)</td>
<td>4 (20.00)</td>
</tr>
<tr>
<td>Overall</td>
<td>60 (100.00)</td>
<td>10 (16.67)</td>
</tr>
</tbody>
</table>

(Figures in parentheses indicate percentages to the respective total)

3.4 Acaricide application and prevalence of the diseases

The relationship between acaridical application and prevalence of babesiosis in cattle was presented in Table 5. The prevalence of babesiosis among the cattle treated with acaricide was 12.68 percent, when compared to those not treated with an acaricide (27.27 percent). The Chi-square analysis revealed a highly significant ($p<0.01$) relationship between prevalence of the disease and acaricide use in cattle.

Table 5: Relationship between acaricide application and prevalence of babesiosis (in numbers)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Acaricide used</th>
<th>Acaricide not used</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affected</td>
<td>18 (12.68)</td>
<td>42 (27.27)</td>
<td>60 (20.27)</td>
</tr>
<tr>
<td>Non-affected</td>
<td>124 (87.32)</td>
<td>112 (72.73)</td>
<td>236 (79.73)</td>
</tr>
<tr>
<td>Total</td>
<td>142 (100.00)</td>
<td>154 (100.00)</td>
<td>296 (100.00)</td>
</tr>
</tbody>
</table>

$\chi^2$ Between Acaricide application and prevalence 9.74**

(Figures in parentheses indicate percentages to the respective total)

4. Conclusion

The study concluded that mortality and case fatality rates were minimum but the economic loss was so high. Hence, care should be taken on the affected animal instantly to avoid these losses. Thus, the losses due to these diseases in cattle could be prevented by application of scientific management practices and control over these predisposing factors. Further lack of knowledge to manage the diseased animals had resulted in avoidable economic losses. Thus, the appropriate policy suggestions have to be made to control of babesiosis in cattle and minimise the economic losses due to this disease.

5. References