STUDIES ON PREVALENCE OF TRYpanosome INFECTION IN ABATTOIRS IN ASABA, DELTA STATE, NIGERIA

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ABSTRACT
This study investigated the prevalence of trypanosome infection in cattle and Red Sokoto (R.S) goats slaughtered at abattoirs in Asaba, Delta State. 304 animals comprising 265 cattle, 39 R.S goats were examined. Blood was collected from the jugular vein of each animal into EDTA containers, placed in cold boxes and transported to the Nigerian Institute for Trypanosomiasis Research (NITR) laboratory in Asaba where standard trypanosome detection methods (STDM), Haematocrit centrifugation technique (HCT) and Buffy coat methods were used to detect trypanosomes and determine Packed Cell Volume (PCV). The result of the investigation showed that seventeen (17) animals were infected giving an overall prevalence of 5.59%. Fifteen (5.66%) of the cattle and two (5.13%) of the R.S goats were infected. Female cattle had higher prevalence of trypanosomiasis (6.78%) than the male cattle (4.76%). Difference in prevalence in female and male cattle was statistically significant (p<0.05). In R.S goats, 6.45% prevalence was observed in the males while no infection was found in the females. Three species of Trypanosoma namely, Trypanosoma vivax, T. congolense and T. brucei brucei were recorded in infected animals. T. vivax, T. congolense and T. brucei brucei were found in the cattle while only T. congolense was found in R.S goats. There was a significant difference between the mean PCV value of infected animals and the non-infected animals (p < 0.05). The result of this study clearly indicates the presence of trypanosome species in the abattoir animals.

Keywords: Prevalence, Trypanosome, Infection

INTRODUCTION
World Health Organisation (1998) has described trypanosomiasis as a complex, debilitating, zoonotic disease of man and animals. It is caused by the protozoan parasite of the genus Trypanosoma. Several species of trypanosomes are found in the blood and other tissues of vertebrates (WHO, 2006). The disease in animals is known as Animal African Trypanosomiasis (AAT) also known as Nagana (Ajakaiye et al., 2013). It is a neglected tropical disease of public health importance and is endemic in 36 African countries (WHO, 2006).

Animal trypanosomiasis accounts for three (3) million livestock death annually in agriculture and mixed farming (Abenga et al., 2002; Samdi et al., 2010a). Bovine (cattle) trypanosomiasis is an important protozoan disease and is transmitted through bites of different species of Glossina and mechanically by a number of biting flies such as Tabanids and Stomoxyys sp. (Oluwafemi et al., 2007). Trypanosome species of economic importance include Trypanosoma vivax which affects domestic and wild ruminants and equines, T. congolense which affects most domestic ruminants and also horses, pigs, camels, dogs as well as wild animals, T.brucell which is infective to all domestic mammals, elephants, T. simiae which occurs in domestic and wild pigs and is also infective to sheep, horses and monkey. The disease is characterized by parasitaemia, fever, anaemia, which among other factors limit the pace of rural development in tropical Africa (Abenga et al., 2002; Fajjinmi et al., 2011). Animal African trypanosomiasis causes impaired bovine fertility, reduction in herd size, low milk production, retarded growth, reduced work output and high mortality rate among infected animals (Ilemobade, 2009).

Beef is one of the most widely consumed meats in the world as it is an excellent source of protein, minerals and B vitamins. Red meat is the most significant dietary source of carnitines and like any other meat such as veal, pork it is a source of creatine (Okoroafor and Nzeako, 2014). Small ruminant such as sheep and goats are largely major sources of animal protein in Nigeria, contributing greatly to total meat consumption in the country. They are also sources of income to small farmers. Red Sokoto goat has superior quality skin and is used to produce one of the best leathers in the Nigerian market.

Animal African Trypanosomiasis is a continuing threat to livestock production, agricultural development and is a major source of economic loss. Inadequate information on the prevalence of a disease of such economic and health importance in the South-South region of Nigeria especially in Delta State necessitates research into its prevalence in the city where cattle and small ruminants play significant role in the economy of the State.

MATERIALS AND METHODS

Study Area
The study was carried out at selected abattoirs in Asaba, Oshimili South Local Government Area of Delta State. This local government lies within the coordinates of longitude 6° 40’ E and 60° 45’E and latitude of 6° 0’N and 6° 15’N. It has a land area of 603km²and a population of 150,032 (National Population Commission (NPC), 2006).

Sample Size
A total of three hundred and four (304) animals comprising two hundred and sixty-five (265) cattle (Bos taurus), thirty-nine (39) Red Sokoto goats (Capra aegarasis) were examined.
Blood Sample Collection
Three (3ml) of blood was collected from individual animal (cattle and goats) from the jugular vein using 5ml syringe and put into specimen bottle containing Ethylene Diamine Tetra-acetic Acid as anticoagulant (EDTA). The specimen bottles containing blood samples were placed in cold box and conveyed to Nigeria Institute for Trypanosomiasis Research (NITR), South-South zonal laboratory in Asaba where further investigations were undertaken.

Parasitological Study
Some of the centrifuged blood-filled capillary tubes were broken using tipped pencil 1mm below the Buffy coat to include the red blood cells layer and 3mm above the Buffy coat to include the plasma. The content was expelled on microscopic slides and was smeared, and then the slides were covered with cover slip and were examined under ×40 objectives and ×10 eye piece using dark ground Buffy coat techniques, to see the movement of the parasite. Once the presence of the parasite was determined, small drop of the blood in the capillary tube was placed on a clean glass slide and spread by another slide at an angle of 45° to make a thin blood film and the slide was air dried and fixed with methyl alcohol, stained with Giemsa stain and air dried. Identification of the different species of trypanosomes was carried out based on their motility, morphology and size under microscope with oil immersion objective lens.

Haematological Study
Blood was collected from the EDTA bottle containing the 3ml of blood using heparinized capillary tubes filled to their 3/4 length. The capillary tubes were sealed with plasticine at each end and centrifuged at 12000 rpm for 5 minutes in a micro-haematocrit centrifuge. Packed cell volume (PCV) was determined using PCV haematocrit reader.

Statistical Analysis
The prevalence of trypanosome infection among animal species, sex of animals and species of parasite were expressed as percentage of the total number of animals examined (Bush et al. 1997). Data was subjected to chi-square test to ascertain the relationship between trypanosome infection, animal species, sex of animals and species of parasite. Student t-test was also used to analyse difference in mean PCV values of animals sampled. The chi-square test and student t-test were carried out using Microsoft excel 2019 package.

Prevalence = \( \frac{\text{Number infected}}{\text{Number examined}} \times 100\% \)

RESULTS AND DISCUSSION
Result
Seventeen (17) out of the 304 livestock examined were positive for trypanosome infection, giving an overall prevalence of 5.59%. Fifteen (15) out of the 265 cattle examined were infected while two (2) out of the 39 Red Sokoto goats were positive for trypanosomes. Thus, the prevalence of trypanosome infection in cattle and Red Sokoto goats was 5.66% and 5.13% respectively. The difference in the prevalence of trypanosome infection in cattle and Red Sokoto goat was not statistically significant (\( p > 0.05 \)) (Table 1).

Table 1: Prevalence of Trypanosomiasis in the Animal Species Studied

<table>
<thead>
<tr>
<th>Animal species</th>
<th>No Examined</th>
<th>No. infected</th>
<th>Prev. (%)</th>
<th>( \chi^2 )</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>265</td>
<td>15</td>
<td>5.66</td>
<td>0.018</td>
<td>0.893</td>
</tr>
<tr>
<td>Red Sokoto Goat</td>
<td>39</td>
<td>2</td>
<td>5.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>304</td>
<td>17</td>
<td>5.59</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key: NE= Number examined; NI =Number infected; Prev. =Prevalence

Figure 1 shows the sex related prevalence of trypanosomiasis in cattle and goats. Among the cattle, 7(4.76%) males out of the 147 examined were infected, while 8(6.78%) females out of the 118 examined were infected. For the Red Sokoto goats, 2(6.45%) out of the 31 males examined were infected, while no infection was observed in the females. The chi-square test (\( \chi^2 \)) carried out showed that there was no significant difference (\( P=0.156 \)) in the prevalence of trypanosomes by sex in the animal species sampled.

Figure 1: Sex related Prevalence of Trypanosomiasis in Cattle and R.S Goats
The prevalence of *Trypanosoma species* in cattle and R.S goats sampled is shown in Figure 2. Of the 265 cattle sampled, 10 (4.10%) were infected with *T. vivax*, 2 (0.75%) with *T. congolense* while 3 (1.13%) were infected with *T. brucei*. Out of the 39 Red Sokoto goats sampled, only 1 (2.56%) R.S goat was infected with *T. congolense*, similarly, 1 (2.56%) was infected with *T. brucei*. The overall prevalence of *Trypanosoma species* in this study were 3.29%, 0.99% and 1.32% for *T. vivax*, *T. congolense*, and *T. brucei* respectively. Chi-square ($\chi^2$) test showed that there was no significant difference (P=0.187) in prevalence of trypanosome species that infected the animal species sampled.

**Figure 2**: Prevalence of *Trypanosoma* Species in Cattle and R.S Goats sampled

The relationship between mean PCV and trypanosomes infection in cattle and goats is shown in Table 2. Out of the 265 cattle examined, 15 were infected while 250 were not infected having mean PCV values of 27.00% and 32.46% respectively. Two (2) R.S goats out of the 39 examined were infected and had a mean PCV of 30.50% while the 37 not infected had a mean PCV value of 31.81%. Student t-test showed that there was significant difference (P=0.039) between the mean PCV values of infected animal species (infected cattle and infected goats). Also at (P=0.000), the mean PCV values of the infected and non-infected animals showed a significant difference.

**Table 2**: Prevalence of Trypanosomes in Relation to Mean PCV in Cattle and R.S Goats.

<table>
<thead>
<tr>
<th>Animal Species</th>
<th>NE</th>
<th>NI</th>
<th>Mean PCV (%)</th>
<th>NNI</th>
<th>Mean PCV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>265</td>
<td>15</td>
<td>27.00±11.1</td>
<td>250</td>
<td>32.46±8.70</td>
</tr>
<tr>
<td>R.S Goat</td>
<td>39</td>
<td>2</td>
<td>30.50±0.00</td>
<td>37</td>
<td>31.81±3.08</td>
</tr>
<tr>
<td>Total</td>
<td>304</td>
<td>17</td>
<td>28.75±10.4</td>
<td>287</td>
<td>32.14±8.19</td>
</tr>
</tbody>
</table>

Key: NE= Number examined; NI =Number infected; NNI= Number non-infected.

The effect of trypanosome infection on mean PCV in relation to sex of cattle and goats is shown in table 3. The table shows that 7 male cattle were infected having a mean PCV of 29.92% and the 140 male cattle not infected had a mean PCV of 32.95% while 8 female cattle infected had a mean PCV of 27.00% and the 110 females not infected had a mean PCV of 37.01%. For Red Sokoto goats, infected and non-infected males had mean PCV values of 2(30.50%) and 15(33.08%) respectively. All female R.S goats were non-infected and had a mean PCV value of 32.71%. Student t-test showed that there was a significant difference (P=0.000) between mean PCV and sex of the infected animal species.

**Table 3**: Trypanosome Infection in Relation to Mean PCV and Sex of Cattle and Goats.

<table>
<thead>
<tr>
<th>Animal groups</th>
<th>Sex of animal</th>
<th>Status</th>
<th>No. examined</th>
<th>Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>Male</td>
<td>Infected</td>
<td>7</td>
<td>29.92±10.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non infected</td>
<td>140</td>
<td>32.95±8.96</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Infected</td>
<td>8</td>
<td>27.00±12.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non infected</td>
<td>110</td>
<td>37.01±8.45</td>
</tr>
<tr>
<td>R. S. Goat</td>
<td>Male</td>
<td>Infected</td>
<td>2</td>
<td>30.50±0.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non infected</td>
<td>29</td>
<td>33.08±2.97</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Infected</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non infected</td>
<td>8</td>
<td>32.71±3.44</td>
</tr>
</tbody>
</table>

Discussion

Results obtained from this study showed an overall prevalence of 5.59%, which is within the range of studies reported by Samdi et al. (2010b) who reported 5.5% prevalence in Angwan Ninzom Keffi Local Government Area of Nasarawa State, though it is higher than the 3.3% previously reported by Elele et al. (2021) in Oshimili North and South Local Government Area of Delta State and also higher than those observed in the reports by Ohaeri, 2010 in Abia State; Samdi et al. (2011) in Kaduna State, Maigari et al. (2015) in Kano State, having prevalence of 1.94%, 2.2%, and 1.8% respectively. The result also shows lower
prevalence than the 9% obtained by Oluwafemi et al. (2007) in Nasarawa State, Nigeria. This suggests that trypanosome prevalence diverge from one epidemiological zone to the other. It is noteworthy that most of the cattle and Red Sokoto goats investigated in this study were brought from the northern part of Nigeria (Taraba State), so it is difficult to determine the exact point of infection in animals that tested positive.

In this study, cattle showed higher prevalence of 5.66% than the R.S goats which had 5.13% prevalence. The result was within range of the reports of Ezebuiro et al. (2008) in Kaduna abattoir who reported 5% and 4.67% prevalence in cattle and goats respectively but contrasted with the report of Maigari et al. (2015) in which goats did not have trypanosomal infection. The prevalence in cattle was higher than 4.69% reported by Fasanmi et al. (2014). The reason for the differences in the result is not clear but could be due to varying ecological and epidemiological factors.

The prevalence of trypanosomiasis in this study agrees with most observations as reported in previous abattoir studies in North-Central, North-West, South-West and Eastern parts of the country (Ameen et al., 2009; Ohaeri, 2010; Fanjinmi et al., 2011; Samdi et al., 2011). Female cattle had a higher prevalence (7.14%) than the males (4.55%) and the difference was not statistically significant. This agrees with the report of Maigari et al. (2015) who recorded 3.17% and 0.06% in females and males respectively, but differs from the reports of Ohaeri (2010); Samdi et al. (2011) and Fasanmi et al. (2014) and who all recorded higher prevalence in males. The higher susceptibility of female cattle does not tend itself to unequivocal interpretation at this point but could be associated with reduced immunity resulting from lactation and stress due to pregnancy. In the R.S goats, males had higher prevalence than the females, which contrasted with the result obtained in Kaduna by Ezebuiro et al. (2009). More studies on the matter would help establish the true situation as concerns prevalence of trypanosomiasis with reference to sex in both cattle and goats.

From this study, T. vivax had the highest prevalence followed by T. brucei and T. congolense at 3.28%, 1.32% and 0.99% respectively. T. vivax having the highest prevalence (4.10%) in cattle was also reported by Samdi et al. (2010b) from Nasarawa State, Ohaeri (2010) and Richard et al. (2014) in Uganda. However, the finding differs from the reports of works carried out in Kaduna central abattoir by Samdi et al. (2011) who reported T. vivax as having the least prevalence in Kaduna abattoir, so also did Oluwafemi et al. (2007) in Nasarawa State and Abraham and Tesfaheywet (2012) in Wozeka, Southern Ethiopia where T. congolense was the predominant trypanosome species observed.

In the R.S goats examined, T. congolense and T. brucei brucei were the only parasites found in infected animals. This is similar to that of Ameen et al. (2008) from Ogbomosho and the report from Leigh and Fayemi (2011) but contrasted with the report of Ezebuiro et al. (2009) where T. vivax had the highest prevalence in goats. The higher prevalence of T. vivax in this study would seem to confirm the species as the most economically important trypanosome species affecting livestock in Nigeria and could be due to its molecular biology which may have been involved in conferring it with resistance against host defences and drugs as suggested by Fasanmi et al. (2014). T. brucei brucei in this study had a prevalence of 1.32% while cattle and R.S goat had 1.13% and 2.56% prevalence respectively. The prevalence of T. brucei brucei in this study was lower than that reported by Fajinmi et al. (2011). The incidence of infection due to T. brucei brucei in this study is of zoonotic importance as human population could be susceptible host (Sam-wobo et al., 2010).

This study showed that there was a significant difference in mean PCV between infected and non-infected cattle and goats (P<0.05). This is in consonance with reports of Maigari et al. (2015) but differs from the report of Mulugeta et al. (2013) for animals in Western Ethiopia who reported no significant difference in PCV values between infected and non-infected animals.

The mean PCV values for infected cattle and R.S goats were 30.25% and 30.50% and 35.52% and 31.98% for non-infected cattle and goats respectively. These values are higher than those reported in Ogbomosho area of Oyo State, South-Western Nigeria by Ameen et al. (2008) for infected and non-infected animals but correspond with report of investigation in Kaduna central abattoir, North central Nigeria by Ezebuiro et al. (2009). The difference in mean PCV values may be due to differences in the breeds of animals involved in the study.

In the present study, the PCV of aparasitaemic and parasitaemic animals were within the range of 12-35% and 10-40% respectively. This implies that anaemia in ruminants is one of the most typical signs of trypanosomiasis. The PCV level usually gives an indication of disease status, though it can also be affected by different factors other than trypanosomiasis. These factors are not always identifiable but are likely to affect infected and non-infected animals (Mulugeta et al., 2013). This is evident from the PCV ranges in this study. Ilemobade (2009) indicated that anaemia associated with trypanosomiasis causes weakness, lethargy and lack of stamina which ultimately reduce efficiency of working animals. However, the effect of trypanosomiasis on the performance of the animals was not determined in this study.

CONCLUSION

From the present study, it could be deduced that trypanosomiasis is present in cattle and Red Sokoto goats slaughtered at abattoirs in Asaba, Delta State. Though most animals slaughtered in Delta State are imported into the State, it is difficult to ascertain where infection actually took place. The presence or occurrence of trypanosome species in animals in these abattoirs could be an indication of importation of infected animals. This could be of great medical importance as these infected animals predispose other livestock in the area to risk of animal trypanosomiasis. It is recommended that; further studies should be carried out in the study area and other areas in the State to throw more light on these issues so as to devise adequate measures to prevent/ control the spread of trypanosomiasis. Also research should be carried out to establish the occurrence of tsetse vector in study areas if the result of such studies would help to give a more complete picture of the presence of tsetse fly.

REFERENCES


