PREVALENCE OF NEWCASTLE DISEASE IN VILLAGE CHICKENS REARED IN LAFIA, NASARAWA STATE. NIGERIA.

By

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ABSTRACT: The aim of this study was to investigate the prevalence of Newcastle Disease in Lafia Local Government Area of Nasarawa State, Nigeria. Five districts were selected which includes; Lafia central, Shabu, Kwandare, Assaki and Agyaragu. A total of 1,250 samples were randomly collected for a period of 18 months (June 2011 to November, 2012). Haemagglutination Inhibition (HI) Test was used to analyze 820 males and 430 female chickens’ sera for Newcastle Disease (ND) virus antibodies using the haemagglutination test method. Haemagglutination Inhibition test was used for detection and quantification of antibodies against Newcastle Disease virus. The HI titre of each bird was determined and expressed in log2 and the mean for each specie was calculated. The results showed that the disease was present and infection had taken place with an overall serum antibody level of 28.72%. birds of the age 13-24 and >48 months were observed to have been mostly affected. The difference was statistically significant (P<0.01). It also showed that only chickens from Assakio had a mean antibody against death from challenge by virulent Newcastle Disease virus.

INTRODUCTION

Village poultry also called Indigenous chicken or free-ranged is an important agricultural activity of most rural communities in Africa (Minga et al., 1989 and Salihu et al., 2010) including Nigeria. Estimate on livestock in Africa shows that poultry population is the highest, about 90% of these poultry are found in rural areas under free range production system and play a vital role in many poor rural households (Alders et al., 2004; Alexander et al., 2004; Hassan et al., 2012). Poultry provide scarce animal protein in the form of meat and egg and can be sold or bartered to meet essential family needs such as medicine, cloths and school fees (FAO, 1997; Creevey, 1991; Salihu et al., 2010). Village chickens are also active in pest control, provide manure and are required for special festivals and are essential for many traditional ceremonies and also fulfill a number of other functions for which its difficult to assign any monetary value (Alders and Spradbrow, 2000).

According to Alders and Spradbrow, (2001) the size of traditional scavenging poultry flocks owned by both African and Asian poultry keepers appear...
to be similar, suggesting that the limits to flock expansion are similar on both continents. Factors such as feed resource are likely to influence flock size and it is probable that disease is one of the main constraints to village chicken production. Thus when flocks are routinely vaccinated against diseases such as Newcastle disease the average flock size increases.

Newcastle Disease is a viral disease of birds caused by a filterable virus. According to Alexander (1997) newcastle disease virus belongs to the family Paramyxoviridae and it could be par acute, acute and sometimes subclinical contagious disease of poultry (Health et al., 1991).

Newcastle Disease is considered to be among the most important disease of poultry and its outbreaks could result to a mortality up to 100% (Alders and Spreadbrow, 2001; Saidu and Abdu, 2008).

Whiteman and Bickford, (1983) reported that Newcastle Disease infection takes occur through virus inhalation or ingestion and its spread from one bird to another depending on the availability of the virus in its virulent infectious form and its has a short incubation period of 5-6 days (Chansiripomchai and Sasipreeyajan, 2006). Okwor and Eze, (2010) reported that Newcastle disease affects the respiratory, gastrointestinal and nervous systems of the infected birds with common signs of listlessness, increased respiratory rate, yellowish to greenish diarrhea and weakness followed by prostration and death.

In Nigeria, a study carried out in rural chickens by Ezeokoli et al. (1984), showed a 73% prevalence of antibodies against Newcastle Disease virus in traditionally managed backyard flocks in Zaria, while 63% seroprevalence was reported by Orajaka et al. (1999) in south eastern Nigeria. In south western Nigeria around Ibadan, 38% seroprevalence was reported by Oyewola et al. (1996). These observed regional differences in Newcastle Disease seroprevalence showed ecological area variations in Newcastle Disease virus activity and may perhaps be a reflection of the impact of environment on the viability of Newcastle Disease virus, spread and its epidemiology (Orajaka et al., 1999).

The target area of this research work; Lafia local Government, is no different although the majority (80%) of farmers keep poultry, predominantly chickens of indigenous breeds. This study is aimed at investigating the incidence of Newcastle disease in village chicken through haematologgutination test (HT) using avian sera and to propose a feasible control and preventive measures against this deadly disease in Lafia and its environment.

MATERIALS AND METHODS

Location and Climate:

Lafia is the state capital of Nasarawa state, located in the North Central part of Nigeria between Latitude 8°35’N and longitudes 8°32’E; mean temperature of 32°C and altitude 181.53m. Five districts in Lafia were selected based on the population of the rural poultry, these districts were Lafia central, Shabu, Kwandare, Assaki and Agyaragu. All these districts can be approached from different cardinal points from the Local government.

Experimental Birds and their Management:

1250 local chickens were used in this study and the type of management system practiced was the extensive system. Chickens scavenged around households feeding on locally available feed resources such as insects, kitchen wastes, residues from farm harvest, earthworms etc. At night they either perches on trees or in a locally constructed houses. The birds were not vaccinated but very occasionally receives antibiotic tablet originally intended for human use, water and sometimes supplementary feeds is provided.
Sampling frame and Sampling Technique:

Weekly visits were made to the districts for stratified sampling which includes chickens of all ages and sex. A total of one thousand two hundred and fifty (1250) blood samples were randomly collected through the jugular or wing vein using sterile 2 ml syringe and 21 G needle. The blood samples were collected from chickens of different ages using universal bottles, and this includes 820 males and 430 female chickens. The samples were slanted for effective clotting and for maximum serum separation to take place. The sampling period was from June, 2011 to November, 2012. All sample collected were transported in ice-packed insulated box to the laboratory in National Veterinary Research Institute Vom Plateau state. The separated sera were decanted into sterile bijou bottle and stored at 20°C for further analysis.

Haemagglutination Inhibition Test (HIT):

The test was based on inhibition of Newcastle Disease viral agglutination by specific Newcastle Disease antiserum as described by Beard (1989) and OIE manual (2004). Phosphate buffered saline in 0.025ml (1 vol.) volume was dispensed into each well of a plastic V-bottom microtitre plates. A volume of serum (0.025ml) was added into the first well of the plates and a two-fold serial dilution of the same volumes of the serum was made across the plates. One volume (0.025ml) of Newcastle Disease virus antigen diluted to yield 4 HA units was added into each well and left for a maximum of 30 minutes at room temperature of about 25°C. Equal volume (0.025ml) of 1% chicken red blood cell was thereafter added to each well. After gentle mixing using a multi-plate shaker, Red Blood Cells were allowed to settle at room temperature (25°C) for 40 minutes. When the red blood cells settled to distinct button, test was read to the highest dilution of serum causing complete inhibition of 4 HA unit of antigen. The agglutination was assessed more exactly by tilling the plates. Only those wells in which the Red Blood Cells ‘streamed’ at the same rate as the control, (containing 0.025ml RBC and 0.025ml PBS only) were considered as showing inhibition. The validity of the result was assessed against a negative control serum which gave less than log 2 HI titre and a positive control serum which had HI titre log 28

Statistical Analysis:

The results of haemagglutination inhibition test for the eighteen (18) months of sampling from June, 2011 to November, 2012 were subjected to Chi-square analysis with a view to finding out which age class of the chickens was susceptible to the Newcastle disease virus. The antibody titres of the sera from the five districts were summed up to mean titre strength by analysis of variance with a view to finding which district chickens possessed the antibodies that can adequately protect them against the devastating effect of Newcastle disease in the event of an outbreak.

RESULTS

The haemagglutination inhibition test of the two hundred and fifty samples collected from each districts Lafia central had 85.6% negative and 14.4% positive HI titre. The negative HI titre for shabu was 66.8% against its positive of 33.2%. Kwandare, Assakio and Agyaragu had 70.8% negative against 29.2% positive, 66.0% negative against 34.0% positive and 67.2% negative against 32.8% positive HI titre respectively (Table 1).
Table (1): Percentage of birds from the five districts responding to the Haemagglutination Inhibition Test.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Districts Collected</th>
<th>Total sample</th>
<th>Negative Titre (%)</th>
<th>Positive Titre (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lafia central</td>
<td>250</td>
<td>85.6 (214)*</td>
<td>36 (14.4)*</td>
</tr>
<tr>
<td>2</td>
<td>Shabu</td>
<td>250</td>
<td>66.8 (167)*</td>
<td>83 (33.2)*</td>
</tr>
<tr>
<td>3</td>
<td>Kwadare</td>
<td>250</td>
<td>70.8 (177)*</td>
<td>73 (29.2)*</td>
</tr>
<tr>
<td>4</td>
<td>Assakio</td>
<td>250</td>
<td>66.0 (165)*</td>
<td>85 (34.0)*</td>
</tr>
<tr>
<td>5</td>
<td>Agyaragu</td>
<td>250</td>
<td>67.2 (168)*</td>
<td>82 (32.8)*</td>
</tr>
</tbody>
</table>

* Actual number of birds responding to HI test.

The HI titre of serum antibody obtained from sample collected from the districts were shown in (Table 2). A total of 28.72% serum antibody was obtained from the sera samples collected. Of the serum antibodies obtained, 10% gave a HI titre strength of log 2^1, 6.64% had log 2^2, log 2^3 and 2^4 had 2.8% each while log 2^5 had 1.36%, log 2^6 had 1.44% while logs 2^7 and > 2^8 constituted 1.84%.

Table (2): Serum antibody titre levels in village chicken from the five districts.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Districts</th>
<th>2^1 (10)*</th>
<th>2^2 (6.64)</th>
<th>2^3 (2.8)</th>
<th>2^4 (1.36)</th>
<th>2^5 (1.44)</th>
<th>2^6 (1.84)</th>
<th>2^7 (1.84)</th>
<th>&gt; 2^8 (1.84)</th>
<th>28.72</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lafia central</td>
<td>14</td>
<td>9</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Shabu</td>
<td>33</td>
<td>19</td>
<td>8</td>
<td>8</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Kwadare</td>
<td>30</td>
<td>20</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Assakio</td>
<td>16</td>
<td>17</td>
<td>7</td>
<td>10</td>
<td>4</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Agyaragu</td>
<td>32</td>
<td>18</td>
<td>12</td>
<td>11</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

* Percentage serum antibody levels at various agglutinations

The distribution of Newcastle disease prevalence according to different age groups of the village chicken is shown in Table 3. Chi-square analysis was used in determining the susceptibility of the different age groups to the Newcastle disease virus. The result revealed that chickens between the ages of 9-12 months had chi-square value of 9.75. 13-24 months had 2.69. Birds of 25-36 months had 6.74 while those of over 48 months of age had 0.0012.
Table (3): Susceptibility of Age class to Newcastle disease virus in village chicken from the five districts.

<table>
<thead>
<tr>
<th>Age class in Months</th>
<th>Positive HI Test</th>
<th>Negative HI Test</th>
<th>Total</th>
<th>X² value</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-12</td>
<td>21 (6.95)*</td>
<td>108 (2.80)*</td>
<td>129</td>
<td>9.75</td>
</tr>
<tr>
<td>13-24</td>
<td>134 (1.92)*</td>
<td>280 (0.77)*</td>
<td>414</td>
<td>2.69</td>
</tr>
<tr>
<td>25-36</td>
<td>118 (3.74)*</td>
<td>226 (1.50)*</td>
<td>344</td>
<td>5.24</td>
</tr>
<tr>
<td>37-48</td>
<td>50 (4.80)*</td>
<td>187 (1.94)*</td>
<td>237</td>
<td>6.74</td>
</tr>
<tr>
<td>&gt;48</td>
<td>36 (0.008)*</td>
<td>90 (0.004)*</td>
<td>126</td>
<td>0.0012</td>
</tr>
<tr>
<td>Total</td>
<td><strong>359 (17.41)</strong>*</td>
<td><strong>891 (7.0104)</strong>*</td>
<td><strong>1250</strong></td>
<td><strong>24.4212</strong>*</td>
</tr>
</tbody>
</table>

*Chi-square values of different age class of birds for both positive and negative haemagglutination inhibition titres.

From statistical analysis there is significant difference (P<0.05) in the prevalence of Newcastle Disease antibodies according to different age class of the chicken (Table 3).

Appendix 1
Analysis of variance for HI titre strength

<table>
<thead>
<tr>
<th>Source</th>
<th>BF</th>
<th>Seg. SS</th>
<th>Adj. SS</th>
<th>Adj. MS</th>
<th>F</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Districts</td>
<td>4</td>
<td>145.667</td>
<td>145.667</td>
<td>36.417</td>
<td>7.82</td>
<td>0.00</td>
</tr>
<tr>
<td>Error</td>
<td>355</td>
<td>1654.233</td>
<td>1654.233</td>
<td>4.660</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>359</td>
<td>1799.900</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Means for Strength

<table>
<thead>
<tr>
<th>Districts</th>
<th>Mean</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.833</td>
<td>0.3598</td>
</tr>
<tr>
<td>2</td>
<td>2.568</td>
<td>0.2399</td>
</tr>
<tr>
<td>3</td>
<td>2.789</td>
<td>0.2493</td>
</tr>
<tr>
<td>4</td>
<td>4.106</td>
<td>0.2341</td>
</tr>
<tr>
<td>5</td>
<td>2.482</td>
<td>0.2369</td>
</tr>
</tbody>
</table>

DISCUSSION

The results of the Haemagglutination inhibition test on all the sampled village chickens from the studied areas showed the presence of Newcastle Disease. Though, the trend of distribution of the Newcastle Disease virus varied from place to place. It is significant to note that the virus is within the state. This finding is confirms an earlier report by Friend and Trainer (1970) of the serological evidence of Newcastle in large number of local chickens in Nigeria.

Furthermore the results agrees with the field observations by Sa’iđu et al., (2004) who stated that It is important to note that even among the galliformes, the village or local chicken has the highest mean HI antibody titre than all other galliformes tested. This could mean that the chicken is more susceptible to Newcastle Disease viral infection than all other species of bird tested. Similarly, further
reported that Newcastle Disease virus is very endemic. In fact this finding is not only of significance to the farmer as a result of the death of the chickens but that such affected chickens if survived could eventually become carriers and help in disseminating the virus to other birds.

The study revealed that, the presence of HI antibody in 28.72% of the village chickens sampled showed that the disease was present and infection had taken place hence the development of that level of antibody. Zeleke et al., (2005) reported that, the significant sero positive rate of Newcastle Disease in village chickens is indicative of the continuous infection pressure. This might be because of the free ranging management system that allows the uninterrupted cycle of infection as the virus passes from one to the other.

The chickens are also prone to acquire infection from wild birds. Since the birds were not vaccinated, they may have been exposed to natural infection in the field. The finding is similar to the report by Alexander (1990) who reported Newcastle Disease antibody in the serum of unvaccinated chickens shows that infection had taken place. This finding is not unexpected as chickens under the extensive system of management are likely to show higher preponderance of the disease due to lack of vaccination. Furthermore the exhibition of various levels of antibodies in the sampled birds indicates varying levels of exposure to the Newcastle Disease virus hence their expected immune status. This has confirmed an earlier report by Alders and Spradbrow (2001) that the disease in chickens is dependent among other factors on the expected immune status of the host and environmental conditions.

As for the prevalence of Newcastle Disease with respect to age, the results revealed variations in terms of susceptibility to the disease virus within the different age class. This shows that there was association between age of chickens and Newcastle Disease infection. Results of Chi-square analysis showed chickens of age of 13-24 and >48 months to be mostly affected. This finding agrees with the report by Alexander (1998) who enumerated age of the chickens as one of the chief determining factors in the pathogenicity of Newcastle Disease virus.

The study also revealed that, chickens of 48 months and above had a high prevalence of the disease, since the infection is immune related (Alders and Spradbrow, 2001; Alexander, 1998), the finding is not unusual. This is because while at an early age the immunity is not yet fully developed, at the other extreme, i.e. as the chicken ages, the immunity wanes down thereby making the bird more prone or less resistant to the invading virus, this finding is also significant, even though the Newcastle Disease prevalence appeared to be more in the younger chickens. It also affects birds of all ages.

**RECOMMENDATIONS**

The control of this Newcastle Disease in village chickens can make a vital contribution to the improvement of household food security and poverty alleviation in our state and country at large. In some circumstances, contact between small scale farmers and veterinary services which in the long run will contribute to improved village poultry production as a whole is recommended. Based on this result, further study should be carryout in other areas of the state in general and also virus isolation and characterization of the spreading virus strains should be carried out to provide more information that could be used in formulating and planning an effective control of the disease in the state, thus providing good ground for total control in the country.
REFERENCES


