Prevalence of Newcastle Disease Diagnosed at the Avian Clinic, Ahmadu Bello University, Zaria, Nigeria: A retrospective survey

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**ABSTRACT**

**Introduction:** Newcastle disease (ND) is a viral disease of birds caused by a negative sense single-stranded RNA virus known as the Newcastle disease virus. It is a disease of almost all species of domestic and wild birds with devastating impacts on poultry health and production. The aim of this study was to determine the prevalence of ND within species, breeds, age and vaccination history from the period of 2014-2018.

**Methods:** A five-year retrospective study (2014-2018) of cases of poultry diseases diagnosed at the Avian Clinic of Veterinary Teaching Hospital (VTH), Ahmadu Bello University (A.B.U), Zaria, Nigeria was conducted, the prevalence of ND within species, breeds, age and vaccination history was determined. Case records file were collected, studied, and clinically diagnosed cases of ND were extracted.

**Results:** It was observed that of the 1,768 poultry cases presented, 754 (42.6%) were confirmed as ND. Most cases were recorded in chickens 710 (40.2%). The prevalence was highest in the improved breed 670 (37.9%) while the local and unknown breeds had prevalence of 4 (0.2%) and 80 (4.5%) respectively. Birds within 8-13 weeks of age had the highest prevalence of 276 (15.4%) while the lowest prevalence of 19 (1.1%) was recorded in birds of unknown ages. Birds with history of incomplete vaccination (single vaccination) had the highest prevalence of 232 (13.1%), while those with complete vaccination history (three rounds of vaccination) had the lowest prevalence of 50 (2.8%).

**Significance:** Poor management practices and improper knowledge of vaccination by the poultry handlers may be responsible for the prevalence pattern of ND recorded. Adequate biosecurity measures and routine vaccination are recommended to minimize the outbreak of ND.

**Keywords:** Age, Breeds, Newcastle disease, Species, Vaccination.

**Introduction**

Newcastle disease (ND) is an acute, highly contagious and rapidly spreading viral disease affecting birds of all ages (Abdu, 2005), which has no breed and age restriction (Alexander, 2000; Alexander, 2003; Abdu et al., 2004; Haque, 2010). It is caused by a virus of the genus Avulavirus, in the family Paramyxoviridae and subfamily Paramyxovirinae (Al-Garib et al., 2003). It is characterized by morbidity and mortality rates up to 100% (Alders and Spreadbrow, 2001; Sa’idu and Abdu, 2008) with respiratory, gastrointestinal and nervous signs (Alexander, 2001). The local breeds of chickens are less likely to develop clinical ND than the improved breed (Ezeokoli et al., 1984). The rural dwellers naturally believe that there is difference in susceptibility to ND between the different breeds of local chickens (Ibrahim and Abdu, 1992) but Sa’idu et al. (2005) reported that all breeds of local chickens are equally susceptible to ND. It was reported by Abdu et al. (2005) that ND affects both young and old birds, though chicks under two weeks old with high level of maternal antibodies may be less susceptible (Sa’idu et al., 2006). Abdu and Garba (1989) reported that maternal antibodies play role in protecting chicks against ND, which declines in chicks to a non-protective level by two weeks of age (Sa’idu et al., 2006).

Vaccination is carried out as a preventive measure in many countries against ND, nevertheless, outbreaks have been reported in vaccinated flocks (Van Boven et al., 2008; Okwor et al., 2010; Ohorse et al., 2002). Different types of vaccines are available but the most successful and widely used are the mild live vaccines known as Hitchner B1 and La Sota types (Aliyu et al., 2014). In Nigeria, ND is mainly controlled by vaccination. The vaccines mostly used are live and includes Hitchner B1, La Sota and Komarov (Abdu et al., 2005). Some farms concurrently used killed oil emulsion Komarov vaccines and a new viscerotropic vaccines (Adene et al., 2003). Newcastle disease has become endemic in both local and commercial poultry in Nigeria, with annual epidemics recorded in highly susceptible flocks (Sa’idu and Abdu, 2008). The outbreaks have shown a continuous presence of ND virus in poultry population since it was first reported (Sa’idu et al., 2006). In some parts of Nigeria, ND has been rated one of the major constraints to the development of the village poultry production (Adene et al., 2003). In North-western Nigeria, ND is enzootic among poultry population and increasingly becoming a major obstacle to the poultry farmers with consequent effect of lowering the poultry productivity in the area (Aliyu et al., 2014;
Materials and methods

Study period

This study involved a five – year retrospective survey of ND cases, from January 2014 to December, 2018.

Sources of data

The data used for the study were obtained from clinic record books and files in the Avian Clinic of Ahmadu Bello University, Veterinary Teaching Hospital (ABUVTH), Zaria. Access to clinic record books and case files was facilitated by a letter of introduction issued to the Head of Clinic by the Head of Department, Veterinary Pathology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria. A case was considered as any report to the clinic that was diagnosed as ND. The diagnosis of ND in this study was majorly by history of the case, clinical manifestations observed by the clinicians and post mortem lesions of carcasses of affected birds. Other information such as age of birds, types of bird, production system, nutritional status, sex, and occurrence of concurrent diseases were also considered.

Data analysis

The data obtained were presented in tables with respect to the prevalence of ND and other poultry disease according to species, breeds, age and vaccination using descriptive statistics.

Table 1. Prevalence of Newcastle disease cases based on breed, reported to the Avian Clinic of ABUVTH from January 2014-December 2018

| Breeds       | ND cases | Non-ND cases | Total No. of cases | Prevalence of ND case (%) |
|--------------|----------|--------------|--------------------|---------------------------|
| Improved Breed | 670      | 836          | 1506               | 37.9                      |
| Local Breed  | 4        | 6            | 10                 | 0.2                       |
| Unknown Breed | 80       | 172          | 252                | 4.5                       |
| Total        | 754      | 1014         | 1768               |                           |

Chi square ($\chi^2$) = 14.36, $p = 0.0008$, ND cases – Newcastle Disease cases, Non-ND – Non-Newcastle Disease cases, ABUVTH - Ahmadu Bello University, Veterinary Teaching Hospital, Improved Breed – commercial layer and broiler recorded in the case files, Local Breed – native bird recorded in the case files, Unknown Breed – bird in the case files in which breed could not be verified.

Results

Out of a total of 1,768 poultry cases presented and recorded at the Avian Clinic of ABUVTH, within the period studied (January 2014 to December, 2018), 754 (42.6%) cases were confirmed as ND. The prevalence was highest in improved breed 670 (37.9%) while the local and unknown breeds had 4 (0.2%) and 80 (4.5%) prevalence respectively (Table 1). From the chi-square value (14.36) showed that there was statistical significance ($p = 0.0008$) based on breed prevalence of ND. This simply implies that there is an association between the breeds of birds and outbreak of ND.

Based on species prevalence, most cases were recorded in chickens, with the highest prevalence of 710 (40.2%) while turkeys had 19 (1.1%) prevalence (Table 2). There is a significant association ($\chi^2 = 13.37, p = 0.0005$) between species of birds and the outbreak of ND.

Birds within 8 – 13 weeks of age had the highest prevalence 276 (15.4%) while the lowest prevalence of 19 (1.1%) was recorded in birds of unknown ages (Table 3). Age of birds ($\chi^2 = 332.2, p = 0.0005$) is significantly associated with the outbreak of ND.

Birds with history of incomplete vaccination (single vaccination) had the highest prevalence of 232 (13.1%), while those with complete vaccination history (three rounds of vaccination) had the lowest prevalence of 50 (2.8%) (Table 4). From the chi-square value (99.17) showed that there was statistical significance ($p = 0.0005$) based on vaccination prevalence of ND. This also implies that there is an association between vaccination prevalence and outbreak of ND.
Table 2. Prevalence of Newcastle disease cases based on species, reported to the Avian Clinic of ABUGTH from January 2014-December 2018

| Species         | ND cases | Non-ND cases | Total No. of cases | Prevalence of ND cases (%) |
|-----------------|----------|--------------|--------------------|----------------------------|
| Chicken         | 710      | 942          | 1652               | 40.2                       |
| Turkey          | 19       | 46           | 65                 | 1.1                        |
| Ornamental birds| 2        | 6            | 8                  | 0.1                        |
| Water fowls     | 3        | 9            | 12                 | 0.2                        |
| Unknown         | 20       | 11           | 31                 | 1.1                        |
| Total           | 754      | 1014         | 1768               |                            |

Chi square ($\chi^2$) = 13.47, p = 0.0005, ND cases – Newcastle Disease cases, Non-ND – Non Newcastle Disease cases, ABUGTH – Ahmadu Bello University, Veterinary teaching Hospital, Ornamental birds – Ostrich, Peacock, Pigeon, Water fowls – Ducks, Geese, Unknown Breed – Bird in which breed could not be verified

Table 3. Prevalence of Newcastle disease cases based on age, reported to the Avian Clinic of ABUGTH from January 2014-December 2018

| Age (weeks) | ND cases | Non-ND cases | Total No. of cases | Prevalence of ND cases (%) |
|-------------|----------|--------------|--------------------|----------------------------|
| < 2         | 40       | 121          | 161                | 2.3                        |
| 3-7         | 150      | 281          | 431                | 8.5                        |
| 8-13        | 276      | 108          | 384                | 15.4                       |
| >14         | 269      | 434          | 703                | 15.2                       |
| Unknown     | 19       | 70           | 89                 | 1.1                        |
| Total       | 754      | 1014         | 1768               |                            |

Chi square ($\chi^2$) = 332.2, p = 0.0005, ND cases – Newcastle Disease cases, Non-ND – Non Newcastle Disease cases, ABUGTH – Ahmadu Bello University, Veterinary teaching Hospital, Unknown Breed – Bird in which breed could not be verified

Table 4. Prevalence of Newcastle disease cases based on vaccination, reported to the Avian Clinic of ABUGTH from January 2014-December 2018

| Vaccination | ND cases | Non-ND cases | Total No. of cases | Prevalence of ND case (%) |
|-------------|----------|--------------|--------------------|----------------------------|
| None        | 220      | 342          | 562                | 12.4                       |
| Once        | 232      | 358          | 590                | 13.1                       |
| Twice       | 156      | 170          | 326                | 8.8                        |
| Thrice      | 50       | 124          | 174                | 2.8                        |
| Unknown     | 96       | 20           | 116                | 5.4                        |
| Total       | 754      | 1014         | 1768               |                            |

Chi square ($\chi^2$) = 99.17, p = 0.0005, ND cases – Newcastle Disease cases, Non-ND – Non Newcastle Disease cases, ABUGTH – Ahmadu Bello University, Veterinary Teaching Hospital, Unknown – Vaccination status not known.
Discussion

From the results, with regards to the breed prevalence of ND cases, the improved breeds had the highest prevalence, while the local breeds recorded lowest prevalence. Farmers tend to keep more of improved than local breeds, therefore, one may expect more of the reported cases to be of improved breed, and hence more of diagnosed cases will be of the improved breed. This finding agrees with the report of Halle et al. (1999) and Ibitoye et al. (2013) that improved breeds are more susceptible to ND than local breed. They associated this probably due to the fact that improved breeds are mostly kept in confinement in which most of the birds are overcrowded, coupled with lack of adequate biosecurity measures which might increase the rate of direct contact between the healthy and infected birds and this promotes the spread of disease among birds.

The percentage of ND cases for chickens was highest compared to others species. This is in line with the report that chickens are the most susceptible species to ND than all other species of birds (Alders and Spadbrow, 2001). This also conforms to the earlier report by Aliyu et al. (2014) that chickens still remain the most susceptible bird species to ND, followed by turkey. The prevalence of ND (1.1%) observed in turkey was lower than (37.9%) reported by Aliyu et al. (2014), this could be attributed to decrease turkey production during the period under review, hence reduced number of cases reported.

The disease was also reported in ducks and geese and this corroborates also the result previously reported by Aliyu et al. (2014), that waterfowls (ducks and geese) known to exhibit subclinical infection are now showing clinical disease condition. The percentage of ND prevalence (0.2%) observed in waterfowls was also lower than (28.6%) reported by the same author. The lower cases recorded in both turkey and waterfowls (19 and 3 respectively) may be due to expensive nature of these species, coupled with the economic situation of the country in which only few people are able to raise these species of birds and hence low cases reported and documented.

The birds within 8 – 13 weeks of age had the highest prevalence, while the lowest prevalence was recorded in birds of unknown ages. The lowest prevalence observed does not correspond to the findings of Halle et al. (1999) who reported that birds within 9-10 weeks are more resistant to ND, this he attributed to the presence of substantial antibody titre due to ND vaccination at 6 weeks of age. The highest prevalence of disease in birds within 8 – 13 weeks of age may be due to the fact that maternal antibodies play a role in protecting young birds against ND which may be absent in older birds (Garba, 1989), thus predisposing them to ND. Cases of older birds were mostly reported (Table 3), making it more of the diagnosed cases within the study period.

Birds with history of incomplete vaccination (single vaccination) had the highest prevalence while those with complete vaccination history (three rounds of vaccination) had the lowest prevalence. The outbreaks of ND in vaccinated flocks may be due to the fact that vaccines used are sourced from unreliable vaccine distributors in which adequate storage facilities are a problem as a result of irregular power supply. Most of the vaccine sellers hardly use ice pack at any point in time that would help to maintain vaccine cold chain from the vaccine source to point of usage. Exclusive dependence on the erratic power supply for vaccine storage may lead to vaccine failure (Okwor et al., 2009). The availability of poor-quality vaccines and presence of unreliable vaccination schedules against ND could have contributed to the increase rate of the disease. Likewise, farmers that fail to complete the vaccine regimen could be a contributing factor. Besides, the control of the disease by vaccination may be ineffective due to the heat labile nature of the ND vaccine (Spadbro, 2001).

Conclusion

In conclusion, this study provides useful information on current distribution status of Newcastle disease based on species, breed, age and vaccination with respect to cases reported to ABUVTH, Zaria and its environs. The results indicated that ND is more encountered in improved breeds than local breeds, and chickens are more susceptible to the disease than other species. Older birds had more prevalence of ND than young birds and that birds with complete vaccination (three rounds of vaccines) had lowered prevalence compared to those with incomplete vaccination.

Hence, it is recommended that farmers should also use local breeds of birds for production since ND is less encountered in local breeds. Also, farmers should be enlightened on proper storage and administration of vaccines as well as the need for effective biosecurity measures against ND in Zaria and its environs.

Conflict of interest

None declared.

References

Abdu, P.A. (2005). Evolution and the pathogenicity of Newcastle disease virus and its implication for diagnosis and control. Proceedings of the Workshop on Improved Disease Diagnosis, Health, Nutrition and Risk Management Practice in Poultry, November 29- December 1, Ahmadu Bello University, Zaria, Nigeria.

Abdu, P.A. and Garba, I.M. (1989). Newcastle disease Haemagglutination, Antibodies in unvaccinated chicks. Zariya Veterinarian, 4(2): 103-105.

Abdu, P.A., Manchang, T.K. and Sa’idu, L. (2004). The Epidemiology and clinicopathological Manifestation of Newcastle disease in Nigerian local chickens In: Proceedings of the 41st Congress of Nigerian Veterinary Medical Association, 22nd -26th November, 2004. Pp. 57.

Abdu, P.A., Sa’idu, L., Bawa, E.K. and Umoh, J.U. (2005). Factors that contribute to Newcastle disease, Infectious bursal disease and fowl pox outbreaks in chickens. Proceedings of the 42nd Annual Congress of the Nigerian Veterinary Medical Association, held at university of Maiduguri, 14th – 18th November, 2005.

Adene, D.F., Oladele, O., Akpavie, S. and Lawal, J. (2003). Immunogenicity and safety of a new viscerotropic Newcastle disease vaccine. In: Proceeding of 13th Congress of World Veterinary Poultry Association, July 19-23 Denver Pp 143-144.

Alders, R. and Spadbro, P.B. (2001). Controlling Newcastle Disease in Village Chickens. A field manual. Australian Centre for International Agricultural Research. Monograph No. 82. Pp 37.
Alexander, D.J. (2000). Newcastle Disease and other avian paramyxoviruses. Central Veterinary Laboratory, Wey Bridge, New Haw, Addles tone, Surrey KT15 3NB, United Kingdom. Review of: Science and technical; Office of international Epizootics, 19 (2): 443-362.

Alexander, D.J. (2001). Newcastle disease. British Poultry Science, 42: 5-22.

Alexander, D.J. (2003). Newcastle disease, other avian paramyxoviruses and pneumovirus infections. International Journal of Poultry Science, 11: 63-99.

Al-Garib, S., Geikens, A.L.J. and Koch, G. (2003). Review of Newcastle disease virus with particular references to immunity and vaccination. World Poultry Science Journal, 59: 158-200.

Aliyu, H.B., Sa’idu, L., Abdu, P.A. and Oladele, S.B. (2014). Response of commercial chickens to challenge with Newcastle disease virus (Kudu 1143 Strain) following immunization with different Newcastle disease vaccines. Proceedings of the 51st Congress of Nigerian Veterinary Medical Association held in Kaduna-2014. Pp. 151.

Ezeokoli, C.D., Umoh, J.U., Adesiyun, A.A. and Abdu, P.A. (1984). Prevalence of Newcastle disease virus antibodies in local and exotic chickens under different management systems in Nigeria. Bulletin of Animal Health and Production in Africa, 32: 253-257.

Halle, P.D., Umoh, J.U., Sa’idu, L. and Abdu, P.A. (1999). Prevalence and seasonality of Newcastle disease in Zaria, Nigeria. Tropical Veterinarian, 17(1): 53-62.

Haque, M.H, Hossain, M.T., Islam, M.T., Zinnah, M.A., Khan, M.S.R. and Islam, M.A. (2010). Isolation and detection of Newcastle disease virus from field outbreaks in broiler and Layer chickens by reverse transcription-polymerase chain reaction. Journal of Veterinary Medicine, 8(2): 87-91.

Ibitoye, E.B., Jimoh, A.A. and Mungadi, H.U. (2013). A retrospective (2007-2011) analysis of Newcastle disease diagnosed at Avian Clinic of Veterinary Teaching Hospital, Usman Danfodiyo University, Sokoto, Nigeria. Current Research in Poultry Science, 3(1): 12-17.

Ibrahim, M.A. and Abdu, P.A. (1992). Ethnoagro-veterinary perspectives of poultry management, health and production among the Hausa/Fulani of Rural Nigeria. In: Proceedings of the Scientific Session of the Congress of the Nigerian Veterinary Medical Association. Held at Durbar Hotel, Kaduna, 27th – 30th October, 1992. Pp. 172-181.

Ohore, O.G., Ozejoge, P.C., Emikpe, B.O. and Okojie, V.E. (2002). Survey of antibiotics to NDV in apparently healthy adult Nigeria Indigenous chicken (Gallus domesticus) in Ibadan using ELISA. African Journal of Clinical and Experimental Microbiology, 3(1): 38-20.

Okwor, E.C., Eze, D.C., Nguwu, M.I., Onioniwu, C.N. and Echewonwu, G.O.N. (2010). Antibody profile in laying birds vaccinated with Newcastle vaccine, La Sota. Nigerian Veterinary Journal, 31(2): 148-153.

Sa’idu, L. and Abdu, P.A. (2008). Outbreak of viscerotrophic velogenic form of Newcastle disease in vaccinated six weeks old pullets. Sokoto Journal of Veterinary Science, 7: 37-40.

Sa’idu, L., Abdu, P.A., Tekdek, L.B., Umoh, J.U., Usman, M. and Oladele, S.B. (2006). Newcastle disease in Nigeria. Nigerian Veterinary Journal, 27: 23-32.

Sa’idu, L., Abdu, P.A., Umoh, J.U. and Abdullah, U.S. (1994). Disease of Nigerian Indigenous chickens. Bulletin of Animal Health and Production in Africa, 42(1): 19-23.

Sa’idu, L., Tekdek, L.B. and Abdu, P.A. (2005). Response of local chickens to La Sota and V4 Newcastle disease vaccines. Presented at the 42nd Annual Congress of the Nigerian Veterinary Medical Association, Held at University of Maiduguri, 14th-18th November, 2005.

Spadbrow, P.B. (2001). The epidemiology of Newcastle disease in village market chickens. In: SADC planning workshop on Newcastle disease Control in Village Chickens: Proceedings of An International Workshop, March 6-9, 2000. Maputo, Mozambique, Pp. 53-55.

Van Boven, M., Bouma, A., Fabri, T.H.F., Katsma, E., Hartlog, L. and Koch, G. (2008). Herd immunity to Newcastle disease virus in poultry by vaccination. Avian Pathology, 37(1): 1-5.