

Epidemiological Review of Avian Pox Diagnosed in Sokoto Metropolis, Nigeria (2016-2022)

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Received on: August, 2024

Revised and Accepted on: September, 2024

Published on: October, 2024

ABSTRACT

Modified: Avian pox, a highly contagious disease affecting chickens, turkeys, and other birds, is caused by the Pox virus and presents as nodular lesions on the skin and diphtheritic lesions on mucous membranes. A seven-year retrospective study (2016-2022) was conducted on clinical cases of Avian pox presented at Aliyu Jodi Veterinary Clinic (AJVC) and the Veterinary Teaching Hospital, Usmanu Danfodiyo University Sokoto (VTH-UDUS). During this period, 7,014 cases of poultry infectious diseases were recorded, with 2,066 (28.34%) identified as Avian pox. Specifically, VTH-UDUS documented 1,269 infectious cases, with 622 (49.02%) being Avian pox, while AJVC recorded 6,020 cases, with 1,444 (23.99%) attributed to Avian pox. The highest annual occurrence of Avian pox was in 2016 (38.43%), with the lowest in 2020 (12.61%). Seasonally, the disease was more prevalent during the wet season (61.42%) compared to the dry season (38.58%). Among the affected birds, turkeys showed the highest incidence (60.60%), followed by chickens (23.09%), and pigeons (16.31%). The study concludes that Avian pox was the most prevalent infectious disease during this period, particularly in 2016, during the wet season, and among turkeys. The study recommends increased efforts in disease prevention through vector control and vaccination.

keywords: Aliyu Jodi clinic, Avian pox, retrospective study, VTH-UDUS, Sokoto.

1.0 INTRODUCTION

Avian diseases are among of the biggest constraints to poultry industry. Despite the advances in diagnosis and vaccination, diseases continue to have negative impact on the poultry industry. Avian pox is a highly contagious viral disease of chickens, turkeys and some other birds caused by the Pox virus. Pox virus belongs to the Family-Poxviridae, Subfamily-Chordopoxvirinae and Genus-Avipoxviruses. Three strains of the viruses are recognized which are fowl pox virus, pigeon pox virus and canary pox virus. The strains vary in their virulence and have the ability to infect other avian species (Akanbi *et al.*, 2022). The primary route of infection in the wild is mechanical transmission by biting insects (mosquitoes and midges), lesions are therefore characteristically restricted to the featherless areas around the eyes and nares, on the comb, wattle, lower legs, and feet. Problems with epizootics have emerged with free-range flocks, presumably because they are more exposed to biting insects, as well as to pecking by infected birds and by direct contact through skin abrasions (Akanbi *et al.*, 2022). Cutaneous Avian pox is characterized by the development of proliferative lesions and scabs on unfeathered areas. The virus can also be transmitted via inhalation or ingestion of dust (or dander, representing virus-infected cells shed from cutaneous lesions), or aerosols, leading to the 'diphtheritic form' of the disease, with lesions on the mucous membranes of the mouth,

pharynx, larynx, and sometimes trachea. Avipoxvirus infections of passerine birds (e.g., canaries and finches) can cause significantly higher rates of mortality than those of chickens or turkeys (Hockaday, 2024). Extensive outbreaks are usually observed in tropical and subtropical climates, where biting insects are more difficult to control (Matos *et al.*, 2022). Although the disease is contagious, it spreads slowly (Jacob, 2023).

There are two forms of Avian pox: dry (cutaneous) and wet (diphtheritic). Birds can be infected by either or both forms of the disease. Mortality from both forms of the disease is usually low; there is reduction in egg production and poor performance from the flock, the pace of growth in young birds might slow. Clinical signs vary slightly depending on the form of fowl pox. Birds showing signs of the dry form have raised wart-like lesions on unfeathered areas. Birds showing signs of the wet form have canker-like lesions in the mouth, pharynx, larynx, and trachea. These lesions can plug the trachea which results to suffocation and death. Birds with this form also have discharge from the eyes (Jacob, 2023). Clinical signs are the best way to diagnose fowl pox on clinic floor. Histology of material scraped from lesions showing presence of eosinophilic inclusions (A-type inclusions, Bollinger bodies) in the cytoplasm after staining with haematoxylin/eosin is diagnostic of poxviruses. Basophilic (or B-type) inclusion bodies may

also be seen in the cytoplasm (these represent the sites of virus replication, the so-called ‘viral factories’) as may Borrel bodies (the virions themselves) (Hockaday, 2024). The gold standard method for diagnosis of Avian pox involves demonstration of the infectious virus by inoculation of homogenate of typical skin or diphtheritic lesions onto the chicken allantoic membrane (CAM) (Umar *et al.*, 2021). Characteristic pock lesions of 0.5–2.5 mm in diameter are normally observed 5–7 days post inoculation depending on the virulence of the virus, while characteristic cytopathic effect (CPE) like aggregation of cells, syncytia and plaque formation are seen on cell culture 4–6 days post inoculation depending on the strains of avian pox virus and multiplicity of infection (Umar *et al.*, 2021). Like most viral diseases, there is no satisfactory treatment for avian pox. Vitamin A and iodine-glycerine ointment are used on skin to facilitate healing. While antibiotics among other palliative measures are normally administered to control secondary bacterial infections, prophylaxis can be achieved by vaccination using recombinant or modified live Fowl pox virus vaccines (Hockaday, 2024).

The disease is of economic importance in domestic and wild birds especially in tropical and subtropical countries as it causes depression, reduced appetite, and poor growth or egg production. The disease is self limiting and the course in an individual bird can vary between three to five weeks. Mortality which is low especially in the cutaneous form tends to get exacerbated when secondary infection sets in; especially that of respiratory system (Umar *et al.*, 2021). Even with low mortality, its effects on production is a thing of concern (Moyle and Tablante, 2021).

Diagnosis of Avian pox in both AJVC and VTH-UDUS are based on patients’ history and physical examination. Confirmation of the disease which involves virus isolation, polymerase chain reaction and microscopic examination of tissues are often not done in the clinics due to financial involvements and clients don’t always cooperate. Tests for confirmation are done only for research purposes, as such diagnosis of pox ends at physical examination, the characteristic nodular lesions are pathognomonic of the disease. Considering the long duration of seven years record for data collection, there is possibility of missing records. There is also possibility of misdiagnosis in early stage of the disease where nodular lesions are yet to appear. Limited information on documented cases of Avian pox in the study area necessitated this study considering high occurrence of the disease among other diseases in the area.

2.0 MATERIALS AND METHOD

2.1 Study Area

The study was carried out in Sokoto metropolis Sokoto State. The State is located in the extreme northwest of Nigeria sharing border with the Republic of Niger and Benin to the North and West respectively. It also shares border with Kebbi State to the south and Zamfara state to the East. Its capital, the city of Sokoto is located near the confluence of the Sokoto River and the Rima River with the GPS coordinates 13° 5’ 0” N and 5° 15’ 0” E. The climate has a distinct wet and dry season. The dry season is characteristically long and severe, lasting from October to May while the wet season is short but intensive lasting from June to August. Sokoto is one of the warmest regions in Nigeria with an average daily high temperature of 37°C. During the cool harmattan season from October to February, the temperature is low, about 15.5°C (Wikipedia, 2024)).

2.2 Study Design

The study was designed to collate information from patients’ clinic file records in Avian unit of Aliyu Jodi Veterinary Clinic, Sokoto (AJVC) and Veterinary Teaching Hospital, Usmanu Danfodiyo University Sokoto (VTH UDUS). The study covered a period of seven years (2016 to 2022) with records of Avian pox carefully selected.

2.3 Data Collection

Retrospective data on clinical cases of avian pox among poultry brought for treatment at the state veterinary clinic Aliyu Jodi road Sokoto, and Veterinary Teaching Hospital Usmanu Danfodiyo University, Sokoto were examined for seven years (2016-2022), records of Avian pox were carefully selected. Diagnosis of avian pox at both the State Veterinary clinic and VTH UDUS was usually based on history and clinical observation as well as necropsy findings. Necropsy is rare as the disease especially the cutaneous form which is more common has low mortality rate. Laboratory examination is not usually carried out as the nodular lesions are pathognomonic of the disease.

2.4 Data Analysis

Distribution pattern of poultry diseases in the seven years was statistically analyzed using proportion and simple percentages and charts. The data dealing specifically with common poultry diseases with emphasis on Avian pox were analyzed by year, season (wet and dry) and types of poultry presented with the disease condition.

3.0 RESULTS

A total of 7,289 poultry cases were recorded in both VTH UDUS (17.41%) and AJVC (82.59%) with diagnosed cases of Avian pox having 2,066 (28.34%). Figure 1

shows percentages of the recorded cases in both AJVC and VTH UDUS from 2016 to 2022. Cases of Pox were 622 (43.49%) in VTH UDUS out of 1,269 total number of recorded poultry cases (Table 1), while Pox cases were 1,444 (23.99%) out of 6,020 total number of recorded poultry cases in AJVC (Table 2).

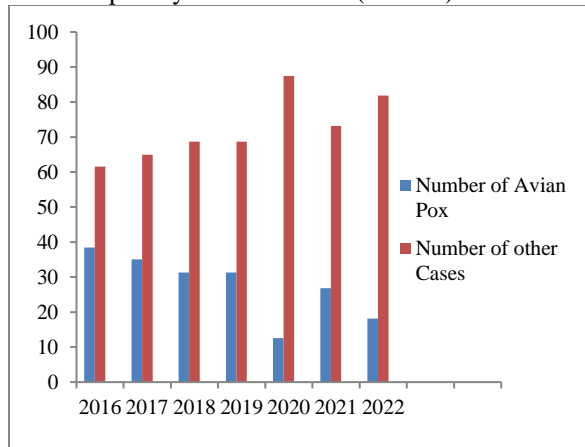


Figure 1: Annual Record of AvianPox and Other Poultry Infectious Diseases in Aliyu Jodi Veterinary Clinic Sokoto and Veterinary Teaching Hospital Usmanu Danfodiyo University Sokoto between 2016 and 2022

The year 2016 presents highest record of Avian pox while 2020 showed least record.

Table 1: Annual Record of AvianPox and Other Poultry Infectious Diseases in Veterinary Teaching Hospital Usmanu Danfodiyo University Sokoto between 2016 and 2022

Year	Number of Avian pox Cases (%)	Number of other Cases (%)	Total (%)
2016	139 (44.84)	171 (55.16)	310(24.43)
2017	109 (48.44)	116 (51.56)	225(17.73)
2018	124 (50.82)	120 (49.18)	244(19.23)
2019	112 (50.68)	111 (49.32)	223(17.57)
2020	13 (48.15)	14 (51.85)	27(2.13)
2021	110 (51.89)	102 (48.11)	212(16.71)
2022	15 (53.58)	13 (46.42)	28(2.20)
Total	622 (49.02)	647 (50.98)	1,269

From the above table, VTH UDUS recorded highest number of Avian pox in 2022 and lowest number was recorded in 2016.

Table 2: Annual Record of AvianPox and Other Poultry Cases in Aliyu Jodi Veterinary Clinic Sokoto between 2016 and 2022

Year	Number of Avianpox Cases (%)	Number of other Cases (%)	Total (%)
2016	319 (36.17)	563 (63.83)	882 (14.65)
2017	243 (31.16)	537 (68.84)	780 (12.96)
2018	173 (24.58)	531 (75.42)	704 (11.69)
2019	138 (23.96)	438 (76.04)	576 (9.56)
2020	30 (9.56)	284 (90.44)	314(5.22)
2021	233 (21.82)	835 (78.18)	1,068 (17.74)
2022	308 (18.17)	1,388 (81.83)	1,696(28.17)
Total	1,444 (23.99)	4,576 (76.01)	6,020

The above table shows that record in AJVC had highest number of Avian cases in 2016 and lowest number was recorded in 2020.

3.1 Distribution of Recorded Cases of Avian Pox among Poultry in AJVC and VTH UDUS Based on Season and Type of Bird between 2016 and 2022

Cases of Avian pox among poultry in AJVC and VTH UDUS based on season and types of bird between 2016 and 2022 showed that out of the total number recorded (2,066), wet season had higher record of 61.35% while dry season had record of 38.65% (Figure 2). Among types of birds presented with the disease, Turkeys had the highest number (60.60%) followed by Chickens (23.09%) and least in Pigeons (16.31%) shown in Figure 3.

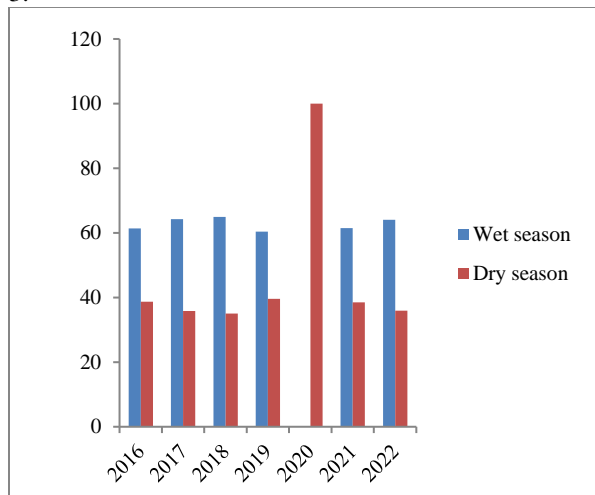


Figure 2: Seasonal Distribution of Cases of Avian Pox in AJVC and VTH-UDUS between 2016 and 2022

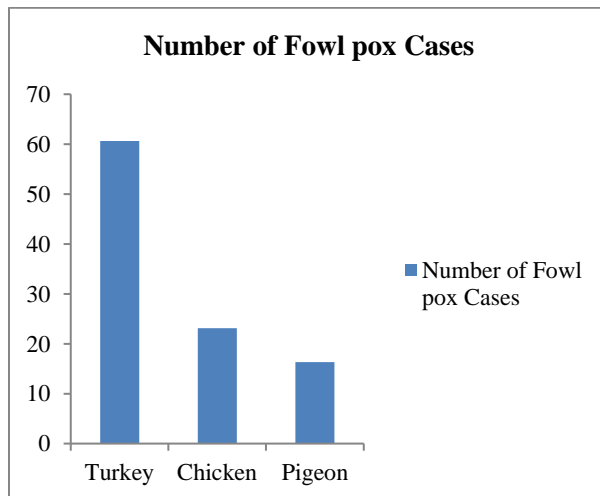


Figure 3: Distribution of Cases of Avian Pox in AJVC and VTH UDUS according to types of bird between 2016 and 2022

4.0 DISCUSSION

A total of 2,066 (28.34%) cases of Avian pox out of 7,289 poultry cases were obtained from file records in the two major Veterinary Clinics in Sokoto metropolis; Aliyu

Jodi State Veterinary Clinic Sokoto (AJVC) and Veterinary Teaching Hospital Usmanu Danfodiyo University Sokoto (VTH-UDUS) between 2016 and 2022. AJVC had 1,444 recorded cases of Fowl pox out of 6,020 avian cases (23.99%) while Avian unit of VTH-UDUS recorded 622 cases of the disease (49.02%) out of the total recorded 1,269 cases within the same period.

Avian cases commonly recorded in VTH-UDUS according to Mungadi *et al.* (2024) for the period of ten years (2012-2021) were Avianpox, Newcastle, Colibacillosis, Fowl typhoid, Lousiness, Helminthosis and Aspergillosis among infectious diseases. While among non-infectious diseases were Heat stress and Canibalism. A total of 1,990 recorded cases were obtained with Fowl pox having the highest number.

Adamu *et al.*, (2009) reported occurrence and distribution of poultry diseases over the period of five years (2004-2008) in VTH-UDUS and Sokoto Veterinary Centre (SVC) now AJVC to be 1,034 cases. The commonest cases were Infectious bursal disease (IBD), 32.9% which was the highest in record, followed by Coccidiosis 14.0%, Newcastle disease (NCD) 12.4%, and Fowl typhoid (FT) 9.9%. This is similar to the reports of Waziri *et al.*, (2017) who reported 0% knowledge of Fowl pox by poultry farmers in some selected areas of Bauchi and Gombe North-Eastern states of Nigeria. This is an indication that the disease was hardly reported in these states. Ibitoye *et al.* (2013) also had a contrary report where pox was not among the most recorded poultry infectious diseases in Sokoto. This shows change in dynamics of poultry disease occurrence pattern in the study area which could be as a result of introduction of some disease agents via vaccines, mutation, antibiotic resistance, successful vaccinations that eventually decreases incidents of some diseases.

For yearly distribution in this study, AJVC record in the year 2016 had the highest number of Avian pox among other disease with 319 cases (36.17%) and year 2020 had the lowest record with 30 cases (9.56%). In VTH UDUS, year 2022 recorded highest percentage of Avian pox cases being 15 out of 28 others (53.58%), while year 2016 recorded lowest percentage of the disease being 139 out of 310 other cases (44.84%). Overall record for the two clinics showed highest percentage in 2016 (38.43%) and lowest in 2020 (12.61%). It could be seen from the results that, in 2016, AJVC had highest record of pox cases and VTH UDUS had the lowest record of the disease pox cases where more reported in AJVC than VTH UDUS in that year. The highest occurrence of the disease in the year 2016 didn't show much difference

with records of other years and could not be associated with a particular reason except with the year 2020.

The year 2020 had the lowest record of Avian pox. This is possibly because from March to October of that year where rainy season fell, all activities were put at halt due to COVID 19 pandemic global lock down. The few cases obtained were in the months of February, November and December which were in dry season. The study by Onyeaka *et al.* (2021) on COVID 19 global lock down stated that most daily life activities including food security, global economy, health and education among others suffered a great set back. There was global rise in healthcare associated cost with negative impact on other non-communicable diseases.

Seasonal distribution of cases of Avian pox in AJVC and VTH UDUS between 2016 and 2022 was 1,669. Higher record was in wet season (61.42%), dry season had lower record (38.58%). The disease is highly reported during rainy season which favors breeding and multiplication of mosquitoes and also other biting arthropods being vectors of the disease as reported by Business Queensline (2024) and Afrimash (2024). Olatunde *et al.* (2016) reported that there was no seasonal variation of occurrence of fowl pox in Plateau State Nigeria. This is possible probably due to difference in climatic conditions of the two geographical locations. Dry season in Sokoto, North-western Nigeria manifests very high temperature with excessive dryness which does not favor arthropods breeding compared to Plateau state, North-central Nigeria which has lower temperature and higher humidity even though the duration of both seasons is the same in the two states.

Distribution of cases of Avian pox in AJVC and VTH UDUS according to types of bird between 2016 and 2022 showed highest occurrence in Turkeys (60.60%), followed by Chickens (23.09%) and lastly Pigeons (16.31%). Turkey rearing in recent years is in the increase in Sokoto and among the common diseases of turkeys is fowl pox. Turkeys have more exposed integument than chickens and pigeons which makes it more possible for biting arthropods to get access to the skin while the pigeons have least exposed integument with feathers covering most parts of the body. The diphtheritic form of the disease is common in pigeons. Adene *et al.*, (2004) and Meseko *et al.*, (2012) reported pox to be more common in free range and backyard poultry flocks, affecting mainly chickens and turkeys.

5.0 CONCLUSION

Prevalence and Distribution: Avian pox was a significant poultry disease in Sokoto metropolis, constituting

28.34% of all recorded poultry cases between 2016 and 2022. The disease was more prevalent at the Veterinary Teaching Hospital Usmanu Danfodiyo University Sokoto (VTH-UDUS), with 49.02% of all poultry cases diagnosed as Avian pox, compared to 23.99% at Aliyu Jodi Veterinary Clinic (AJVC).

Temporal and Seasonal Patterns: The highest occurrence of Avian pox was recorded in 2016, with a notable decline in cases during 2020, likely influenced by the COVID-19 pandemic lockdown, which disrupted routine veterinary services. Avian pox cases were more common during the wet season (61.42%), suggesting a strong association with increased mosquito activity and other vectors.

Species Susceptibility: Among the affected poultry, turkeys were the most susceptible, accounting for 60.60% of Avian pox cases, followed by chickens (23.09%) and pigeons (16.31%). The higher incidence in turkeys could be due to their more exposed skin, making them more vulnerable to vector bites. Recommendation

6.0 RECOMMENDATION

Given the high prevalence of Avian pox, especially during the wet season and in turkeys, it is recommended that preventive measures such as vector control and vaccination be prioritized to mitigate the impact of this disease on poultry production in Sokoto metropolis

7.0 ACKNOWLEDGEMENT

The authors are thankful to the heads of Avian Units of AJVC and VTH-UDUS with the approval of the Directors of both Clinic/Hospital for granting permission to access patients' case file records.

REFERENCES

- Adamu, Y.A., Ahmed, A.B., Abubakar, M.B. and Lawal, M.D. (2009) 'A retrospective study (2004-2008) of poultry diseases diagnosed in veterinary teaching hospital (VTH), Usmanu Danfodiyo University Sokoto (UDUS) and Sokoto Veterinary Centre (SVC), Sokoto State, Nigeria'. *International Journal of Animal and Veterinary Advancement*, 1: 15-17.
- Adene, D. F. and Fatumbi, O. (2004). Case Review and Lesson on Poultry Diseases Control in South West Nigeria. In *Poultry Health and Production, Principles and Practice*. StirlingHorden Publishers (Nig) Ltd, Ibadan, Oyo State, Nigeria, 191-200.
- Afrimash (2024). @<https://afrimash.com/common-poultry-diseases-rainy-season-signs-prevention-treatment/>, accessed on 18th August, 2024.
- Akanbi, O.B., Rimfa, A.G. and Okewole, P.A.

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WEBSITE: <https://fugus-ijsgs.com.ng>

- (2016). Comparative Study on Diphtheritic, Cutaneous and Systemic Forms of Natural Avipoxvirus Infection in Chickens. *J. World Poul. Res.* 6(3): 117-120. Research Paper, PII: S2322455X1600016-6.
- Akanbi, O.B., Obishakin, E.T., Rimfa A.G., Asala O.O., Adedeji, A.J. (2022). Pathology and Characterization Of Fowl Pox Virus Infection in A Turkey-Chicken Backyard Flock, Nigeria. 177-187 DOI: 10.20473/mkh.v33i3.2022. *Journal of Universitas Airlangga*, 177-187
- Business Queensline (2024). Fowl pox @ <https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/animals/diseases/guide/fowl-pox>
- Hockaday, J. (2024). Fowl pox at <https://www.petmd.com/bird/conditions/skin/fowl-1-pox>. Accessed on 18th August, 2024.
- Ibitoye, E.B., Jimoh, A.A. and Mungadi, H.U. (2013). A Retrospective (2007-2011) analysis of Newcastle disease diagnosed at Avian clinic of VTH, Usmanu Danfodiyo University Sokoto, Nigeria. *Current research in poultry science* 3(1):12-17.
- Jacob, J. (2023). Fowl Pox in Poultry. *extension*, 1(2):68-128.
- Matos, M., Tvarogová, J., Bilic, I., Palmieri, N., Mitsch, P., Liebhart, D., Hess, M., and Sommer, F. (2022). Epidemic of cutaneous fowlpox in a naïve population of chickens and turkeys in Austria: Detailed phylogenetic analysis indicates co-evolution of fowlpox virus with reticuloendotheliosis virus. *Original article*, 2913–2923.
- Moyle, J. and Tablante, N. (2021). Recognizing and Preventing Avian Pox in Small Flocks (FS-979) at <https://extension.umd.edu/resource/recognizing-and-preventing-avian-pox-small-flocks-fs-979>
- Meseko, C. A., Shittu, I.A. and Akinyede, O. (2012). Seroprevalence of Fowl Pox Antibody in Indigenous Chickens in Jos North and South Council Areas of Plateau State, Nigeria: Implication for Vector Vaccine. *ISRN Vet. Sci.* doi: 10.5402/2012/154971:1–4.
- Mungadi, H. U., Garba, S., Jimoh, A. A., & Nasir, U. F. (2024) ‘Common Avian Diseases Diagnosed in Veterinary Teaching Hospital, Usmanu Danfodiyo University Sokoto, Nigeria: A Ten Year (2012–2021) Retrospective Study’. *International Journal of Science for Global Sustainability*, 10(1), 83-88. DOI: <https://doi.org/10.57233/ijsgs.v10i1.596>.
- Onyeaka, H., Anumudu, C. K. Al-Sharify, Z.T., Godswill, E. E. and Mbaegbu P. (2021). COVID-19 pandemic: A review of the global lockdown and its far-reaching effects. *Science Progress* Vol. 104(2) 1–18
- DOI: 10.1177/00368504211019854
- Umar, B. N., Adamu, J., Ahmad, M. T., Ahmad, K. H., Sada, A., and Orakpoghenor, O. (2021) ‘Fowlpox virus : an overview of its classification , morphology and genome , replication mechanisms’. *World’s Poultry Science Journal*, 1(8): 1–19.
- Waziri M. I. Abdu P. A. , Sa’idu, L. and Bello, M. (2017). Seroepidemiology and assessment of risk factors for the spread of avian influenza in birds in two Nigerian states. *Vet Med Sci.* 3(4): 227–238. doi: 10.1002/vms3.73.
- Wikipedia (2024). ‘Sokoto State: Subdivision’ @ www.citypopulation.de, Retrieved 7th February, 2024.