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Biosecurity challenges in the control of avian influenza in Nigeria

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Abstract

Highly Pathogenic Avian Influenza (HPAI) has a devastating impact on the economy especially the poultry industry and it jeopardizes food security and public health. The disease which was first reported in Nigeria in 2006, re-occurred in 2015, 2016, 2018 and 2019. Inspite of the efforts the federal government has put into eradicating Avian Influenza in the country, the re-occurrence of the disease points to challenges of control efforts by stakeholders. Biosecurity challenges confronting poultry farmers and live bird market operators were implicated in new outbreaks and spread of HPAI. A cross-sectional study was carried out by administering open ended questionnaires to poultry farmers and live bird marketers in 12 States that shared boundaries with States affected by HPAI in 2019. Using the thematic style of qualitative analysis and MS Excel 2016, data and information with common denominators and pattern were collated and grouped. The One Health approach was adopted for this study. This was achieved by evaluating the knowledge of the stakeholders on the spread of Avian Influenza (AI), the biosecurity challenges they faced, their recommended solutions and new preventive or control measures they were willing to implement in order to achieve biosecurity against AI outbreak. The live bird marketers' responses showed their major challenge to be poor commitment to implementing already known biosecurity rules (22%), followed by unavailability of funds (13%) and sanitation problems. The poultry farmers struggled with lack of funds for maintenance (32%), and lack of compliance to biosecurity by farm attendants (24%). Both groups jointly recommended alleviating strategies such as the improvement of stakeholder education, supportive financing and the strengthening of animal health legislations. These new insights would benefit the formulation and implementing effective pro-biosecurity strategies for the control of avian influenza.

Keywords: Avian influenza, biosecurity, one health, poultry farms, Nigeria.

Introduction

Avian influenza is primarily a disease of wild and domestic birds and is transmissible to humans as zoonosis (Meseko *et al*., 2018). The disease is caused by influenza virus in the family *Orthomyxoviridae* (Alexander & Brown; 2009). Avian influenza presents as low pathogenic avian influenza (LPAI) and high pathogenic avian influenza (HPAI) (Meseko *et al*., 2010; Elelu, 2017). It devastates poultry industry and the economy and has both food security and Public Health implications (Elelu, 2017; Kwaghe *et al*., 2017).

The disease was first reported in Nigeria in February 2006 (Joannis *et al*., 2006). About a decade later, Nigeria reported another HPAI (H5N1) outbreak in January 2015 (Monne *et al*., 2015: Akanbi *et al*., 2016). In December 2016, a novel strain of HPAI (H5N8) was confirmed in a mixed poultry farm in Kano State, and in Nasarawa State in February, 2018, that spread across 25 States including FCT. As at January 2019, over 4 million birds had been exposed, over 300,000 birds died from Avian Influenza and over 3.5 million birds had been depopulated between 2015 and 2019 (Personal Communication NVRI data). Biosecurity and other challenges faced by poultry farmers and live bird market operators had been implicated in the spread of HPAI (Elelu, 2017; Fasanmi *et al*., 2017).

One health has been defined "as the co-operative efforts of numerous disciplines working locally, nationally, and globally, to realize the best health possible for people, animals, and environment" (Lu *et al*., 2016). The concept of One Health is progressively being accepted as a most holistic approach to tackle wide range of complex health problems and zoonotic diseases such as HPAI, not just at the point of effect, but also at the source. Therefore, in dealing with the re-occurrence of this disease using the One Health method, adopting changes and engaging in actions that will address the root causes are requirements for achieving biosecurity (Lu *et al*., 2016).

Biosecurity on the other hand is embracing the implementation of measures that reduce the risk of introduction and spread of disease agents. There are two main principles embedded in biosecurity: bio-exclusion which entails keeping infectious agents from gaining access into the farm or live bird market and bio-containment which consists of preventing infectious agents from leaving the farm or live bird market (FAO, 2008).

In spite of the enormous efforts put into eradicating HPAI, re-emergence of the disease could indicate challenges with control measures (Waziri *et al*., 2017). A number of studies have been published investigating knowledge, attitudes, and practice (KAP) regarding avian influenza among target groups such as poultry workers and live bird workers (Fielding *et al*., 2005; Fasina *et al*., 2009). Past studies also suggested that poultry farms and LBMs play important role in the spread of HPAI (Dairo & Elelu, 2013) and LBMs have also been reported to serve as a melting pot for avian influenza (Elelu, 2017). Several studies on biosecurity in farms and LBMs have also been carried out showing challenges with Avian Influenza control (Ameji *et al*., 2012; Kirunda *et al*., 2014; Waziri *et al*., 2017).

None of these studies however highlighted proffered control measures by the poultry workers and live bird marketers themselves or new measures both groups would willingly implement to achieve biosecurity. This study seeks to assess the study groups' knowledge on the epidemiology of Avian Influenza and also determine the One Health challenges the study groups face in achieving biosecurity against avian influenza.

Materials and Methods

Nigeria lies between 40° and 140° N latitude and 40° to 140° E longitude and has witnessed multiple outbreaks of avian influenza (Akinsanola & Ogunjobi, 2014). An FAO sponsored training was held for the live bird marketers on the implementation of biosecurity measures against avian influenza along the poultry value chain in Nigeria at the National Veterinary Research Institute Vom, Plateau State from 25-03-2019 to 29-03-2019.

All the participants from the States who were invited for the workshop were enrolled for the study. The States in this study share boundaries with Plateau and Bauchi States, they include Federal capital Territory, Adamawa, Gombe, Kaduna, Nasarawa. Plateau, Bauchi, Kano, Rivers, Lagos and Ogun with Live bird markets (LBMs) and farms that had previously been affected by AI outbreaks were also invited by the Directors of Veterinary Services (DVS) of their respective State Ministries of Agriculture for the training.

Using the thematic style of qualitative analysis and MS Excel, data and information with common denominators and pattern were collated and grouped. Data was analyzed using MS Excel 2016.

Results

Forty live bird marketers and forty poultry farmers from these States were present for the training. A total of sixty-three respondents agreed to participate in the survey that included thirty live bird marketers and thirty-three poultry farmers out of the total eighty respondents that were present at the training. Their responses are represented in Tables 1-4.

With average scores of 89% and 78% respectively, both live bird marketers and poultry farmers knew quite well about AI transmission and were able to highlight their perceived challenges regarding establishing and sustaining biosecurity in the LBMs and farms as seen in Table 1.

Responses to AI biosecurity challenges among the live

bird marketers showed that they are poorly committed to implement already known biosecurity measures (22%), followed by unavailability of funds (13%), sanitation problems (10%), traffic issues and congestion (10%) as shown in Table 2.

The poultry farmers' responses to challenges faced showed that lack of funds for maintenance (32%), lack

Table 1: General Knowledge of Avian Influenza

		percentage correct		percentage wrong		percentage who don't know/No response	
		Farmers	LBMs	Farmers	LBMs	Farmers	LBMs
1	What do you know about Avian Influenza?	51	83	5	6	44	11
2	How can Avian Influenza be transmitted within the Live Bird Market?	87	89	4	3	9	8
3	How can Avian Influenza be transmitted to the farm?	96	94	0	0	4	6
4	Average score	78	89	5	5	5	6

Table 2: Challenges of Live Bird Marketers and Farmers in implementing biosecurity against AI in live bird markets and poultry farms

S/N	Challenges	Live Bird Marketers		Farmers	
		Number of responses	Frequency (%)	Number of responses	Frequency (%)
1	Lack of political will	2	3		
2	Poor commitment and co-operation	13	22		
3	Poor relationship between Live Bird Marketers and Veterinarians	3	5		
4	Transportation problem	2	3		
5	Sanitation problem	6	10		
6	Focus of government renovation and incentives in the cities	2	3		
7	Harassment by security officials	1	2		
8	Proper sensitization	1	2		
9	Communication gap	5	8		
10	Mixing of species	1	2		
11	Insufficient cages	3	5		
12	Traffic issues and congestion	6	10		
13	Poor monitoring and implementation of laws and regulations in live bird markets	5	7		
14	Corruption issues	1	2		
15	No plastic crates available	1	2		
16	Lack of funds for maintenance and implementation	8	13	11	32
17	Disaster	1	2		
18	Lack of compliance to biosecurity measures by farm attendants			8	24
19	Lack of adequate disinfectants			2	6
20	Lack of protective clothing			1	3
21	Ignorance of farm staff			2	6
22	Reluctant attitudes of farmers			1	3
24	No challenge			9	26
	Total	60	100	34	100

Table 3: Recommendations of Live Bird Marketers and Poultry farmers to government to improve biosecurity in the live bird markets and poultry farms

S/N	Recommendations to the Government	Live Bird Marketers		Farmers	
		Number of responses	Frequency (%)	Number of responses	Frequency (%)
1	Setting up surveillance team by both State and Federal governments to ensure that farmers implement right biosecurity practices	4	11		
2	Provision of readily available and affordable disinfectants for farmers	10	26		
3	Establishment of functional laboratories for diagnosis within close proximity of farms	6	16		
4	Provision of grants and loans to farmers	5	13		
5	Awareness creation	6	16		
6	Compensation	4	11		
7	Employment of additional Veterinarians	3	8		
8	Making leaders more accountable			1	2
9	Compensation of Live Bird Marketers in case of an outbreak			1	2
10	Government intervention against harassment of poultry transporters			2	4
11	Provision of other stakeholders in industry (Public -Private Partnerships)			1	2
12	Proper and effective monitoring by government and veterinary services			5	1
13	Provision of loans and finance to Live Bird Marketers by government			9	17
14	Provision of equipment and materials by government			12	23
15	Better communication between government and Live Bird marketers to build trust			2	4
16	Awareness creation			15	29
17	Enforcing strict compliance of biosecurity measures on farm			22	28
18	Enforcing laws to back up the Ministry of Agriculture			1	2
19	Partnership between government and Live Bird Market Associations, Poultry Associations			1	2
20	Partnership between government and other stakeholders in the industry			1	2
	Total	38	100	52	100

The poultry farmers' responses to challenges faced showed that lack of funds for maintenance (32%), lack of compliance to biosecurity by farm attendants (24%) and the belief that they had no challenges (26%) were the major problems they faced as seen in Table 2. The results in Table 3 showed that they wanted the government to provide readily available and affordable disinfectants for farmers (26%), followed by awareness creation (16%) and then the establishment of functional laboratories for diagnosis in close proximity to farms (16%). Findings also showed that they need the government to provide grants and loans to farmers (13%), compensate them in case of losses due to AI outbreaks (11%), set up surveillance at both the Federal and State levels (11%) and to employ additional veterinarians (8%) as shown in Table 3. The live bird marketers' list of suggestions to the government are in Table 3. Activities that both the poultry farmers and live bird marketers were willing to implement could be seen in Table 4.

Table 4: New biosecurity measures Live Bird Marketers and Poultry farmers are willing to implement to achieve biosecurity in their various live bird markets and poultry farms

S/N	New biosecurity measures	Farmers		Live Bird marketers	
		Number of responses	Frequency (%)	Number of responses	Frequency (%)
1	Localizing a staff to a pen	2	3		
2	No more use of paper crates	3	4		
3	Stop sharing poultry equipment with other farms	1	1		
4	Training staff regularly on biosecurity	11	14		
5	Proper cleaning and constant disinfection of farm	11	14		
6	Restriction of visitors to farm	18	4		
7	Adequate provision of poultry clothing for poultry attendants	4	5		
8	Adherence to professional advice given by the Veterinarian	3	4		
9	Proper disposal of dead birds	1	1		
10	Enforcing strict compliance of biosecurity measures on farm	22	28		
11	Stop mixing species of birds	1	1		
12	Record keeping	1	1		
13	Use of metal cages			2	3
14	Proper disposal of carcass and waste			2	3
15	Stop mixing of different species in single cages			6	10
16	Proper cleaning and disinfection of cages			9	15
17	Proper traffic control and congestion reduction			8	14
18	Proper construction of poultry cages with proper ventilation			1	2
19	Improve personal hygiene			10	17
20	Stop the use of paper crates			2	3
21	Specific and stable pickup points for egg sellers			1	2
22	Improve communication to the association and Veterinary Services in an emergency outbreak			3	5
23	Increase co-operation between the Live Bird Marketers and Veterinary Services			2	3
24	Increase sensitization and enlightenment of members on the positive contribution of biosecurity in improving poultry sales			8	13
25	Provision of concrete slab for agriculture			1	2
26	Provision of protective covering for members			3	52
27	Separation of sick birds from healthy ones			2	3
	Total	78	100	60	100

Discussion

Previously, FAO had emphasized that poultry sector stakeholders be engaged in a participatory process to ensure those who would implement preventive measures understood the benefits of doing so (FAO, 2008). This method was employed in this training workshop held for these risk groups to address the

biosecurity challenges they faced with respect to AI prevention and control.

LBM respondents had a higher average score than farmer respondents for general knowledge on avian influenza as explained by Fatiregun & Sanni (2008), whose view supports the high knowledge among both respondents as shown in this survey. However, they explained that knowledge was more in workers with more education and those who had more experience. This study also shows respondents' knowledge on transmission to be adequate/sufficient. Increasing knowledge scores over the years shows that there is an improvement in knowledge among the live bird marketers and poultry workers when compared to previous work done by Elelu (2017).

Much of this could be attributed to several trainings on biosecurity measures which the government and other groups have organised from the point of previous outbreaks up until now. The respondents of both groups in this study were highly experienced and could be categorized as high-risk groups whose training will be beneficial as they would help educate other fellow risk group members in their respective domains as previously reported by FAO (2008) and Elelu (2017).

Findings presented in Table 2, highlight the importance of funds in implementing some aspects of biosecurity, like routine paid fumigation of stalls, purchase of quality disinfectants for market entrance and exit points, a veterinary supervised quarantine/check point, *et cetera*. This study suggests that poor attitude could include: lack of seriousness by live bird marketers in following biosecurity rules which they already knew as seen by high knowledge average score where the majority of their responses showed that the live bird marketers know how AI could be transmitted both within the live bird market and within the farms. Lack of commitment to align consistently with taught preventive measures by traders and market authority alike is clearly a monumental setback for the implementation of biosecurity measures in LBMs. As presented in Table 2, the poultry farmers' responses to challenge faced showed that lack of funds for maintenance, lack of compliance to biosecurity by farm attendants and the attitude that they had no challenges were the major problems encountered.

Recommendations of the stakeholders in this study were grouped under the following strategies namely; strengthening legislation, enhancing effective communication and supportive financing. Strengthening legislation is needed for activities in non-health sectors like the poultry industry that influence spread of AI, such as (traffic control) Poultry farming practices, animal movement and LBMs. As supported by Lu *et al*. (2016) such transformations need to be backed with positive and negative incentives to ensure compliance and conformity, this would include proper compensation for those unfavorably affected by AI outbreaks, shifts in practice and fines or more serious disincentives for those who are purposefully uncompliant while providing required government support.

In addition, the live bird marketers also need accountable leaders, provision of infrastructures and enforced laws, to back up the Ministry of Agriculture and to partner with them and other stakeholders. The poultry farmers recommend that the government provide readily available and affordable disinfectants for farmers without which such farms cannot be bio-secured as supported by FAO (2015) that; adequate biosecurity necessitated some public aid, funding or subsidy without which One Health will remain a myth. Furthermore, with regards to strengthening communication as seen in this study (Table 3), both poultry farmers and live bird marketers need more awareness while live bird marketers recommend government intervention against the harassment of poultry transporters, better communication between them and the government to build trust. The long list of measures respondents is willing to implement as presented in Table 4, suggests that training might have influenced such enlightenment and decisions. These would contribute to achieving biosecurity which in turn would lead to better environmental, public and human health.

In conclusion, even though both risk groups had a high knowledge of AI, there is still need for more awareness among poultry farmers and live bird marketers on the One Health implications coupled with the possible socio-economic losses. As policy makers formulate efficient strategies to prevent and control disease outbreaks using these new insights on the perceived challenges, measures they were willing to implement, solutions proffered by both groups, it is also hoped that the policies will be converted to action to address these needs for achieving biosecurity against AI in the poultry industry.

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Conflicts of Interest

The authors declare no conflict of interest.

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