Evaluating a surveillance system: live-bird market surveillance for highly pathogenic avian influenza, a case study

Ndadilnasiya Endie Waziri1,2,5, Patrick Nguku1, Adebola Olayinka2, Ike Ajayi2, Junaidu Kabir2, Emmanuel Okolocha2, Tesfai Tseggai6, Tony Joannis2, Phillip Okewole3, Peterside Kumbish2, Mohammed Ahmed6, Lami Lombin5, Peter Nsubuga5

1Nigeria Field Epidemiology and Laboratory Training Program, Nigeria, 2Department of Epidemiology, Medical Statistics and Environmental Health, University of Ibadan, Nigeria, 3Department of Veterinary Public Health, Ahmadu Bello University, Zaria, Nigeria, 4ECTAD Unit, Food and Agriculture Organization, Bangladesh, 5National Veterinary Research Institute, Vom, Nigeria, 6Global Public Health Solutions, Decatur GA, USA

Abstract

Introduction: Highly pathogenic avian influenza H5N1 was first reported in poultry in Nigeria in February 2006. The only human case that occurred was linked to contact with poultry in a live bird market (LBM). LBM surveillance was instituted to assess the degree of threat of human exposure to H5N1. The key indicator was detection of H5N1 in LBMs. We evaluated the surveillance system to assess its operations and attributes.

Methods: We used the US Centers for Disease Control and Prevention (CDC) updated guidelines for evaluating public health surveillance systems. We reviewed and analyzed passive surveillance data for HPAI (January 2006-March 2009) from the Avian Influenza National Reference Laboratory, and live bird market surveillance data from the Food and Agriculture Organization of the United Nations, Nigeria. We interviewed key stakeholders and reviewed reports of live bird market surveillance to obtain additional information on the operations of the system. We assessed the key system attributes.

Results: A total of 299 cases occurred in 25 (72%) states and the Federal Capital Territory (FCT). The system detected HPAI H5N1 virus in 7 (9.5%) LBMs; 2 (29%) of which were from 2 (18.2%) states with no previous case. A total of 17,852 (91.5%) of samples arrived at the laboratory within 24 hours but laboratory analysis took over 7 days. The sensitivity and positive predictive value (PPV) were 15.4% and 66.7% respectively.

Conclusion: The system is useful, flexible, complex and not timely, but it appears to be meeting its objectives. The isolation of HPAI H5N1 virus in farms within 3 km radius, movement control and improved bio-security measures implemented to stop the spread of the disease, the virus rapidly spread to 25 states including the Federal Capital Territory (FCT) causing loss of over 1 million poultry. Although the World Health
Organization (WHO) reported more than 628 confirmed human cases of avian influenza A (H5N1) globally, approximately two thirds of whom died [6], the first and only confirmed human H5N1 infection in Nigeria was reported in February 2007 [4]. It was traced back to contact with infected poultry in a live bird market (LBMs). LBMs are said to be the most important mixing point for all birds and have been implicated in the spread of H5N1. HPAI. While birds from large and small-scale commercial sectors and scavenging poultry mix in these markets, traders and other intermediaries also serve as vehicles for HPAI transmission. Live bird market surveillance (LBMS) for HPAI was instituted by the Nigerian government in collaboration with the Food and Agriculture Organization (FAO) to improve the understanding of the role of LBMs in the epidemiology of HPAI in Nigeria and the degree of threat of human exposure to HPAI. We assessed the operations, evaluate its key system attributes and assess whether the system is meeting its objectives.

Methods

Data collection and review
We obtained monthly passive surveillance data for HPAI (January 2006-March 2009) from the Avian Influenza National Reference Laboratory, and market surveillance data from the FAO, Nigeria. The data were compiled and reviewed for errors. A case of HPAI was one with a positive laboratory result by agar gel immune diffusion test.

We analyzed the data and compared monthly trend to report performance descriptive epidemiology to summarize the data in person, place and time. A state with a positive laboratory result by agar gel immune diffusion test was judged as having had HPAI H5N1 virus test. The system also detected HPAI H5N1 virus in 7 (9.5%) of 74 LBMs. The system also recorded 7 (9.5%) of 74 LBMs, 2 (29%) of which were from 2 (18.2%) states with no previous HPAI activity.

We used the US Centers for Disease Control and Prevention (CDC) updated guidelines for evaluating public health surveillance systems [3]. We assessed the operations of the system and the system’s attributes, influenza surveillance database and electronic mapping. The live bird market surveillance system has helped in the generation of data on LBMs, their operations, biosecurity practices and the role they play in the epidemiology of H5N1 in Nigeria. It also indicated markets that could be potentially exposed to HPAI. It has also highlighted the need for New Disease surveillance in Nigeria as an integral part of Avian influenza control. The avian influenza epidemic in Nigeria started in January 2006 and seems to have come to an end in October 2008 with 2% surveillance positivity compared to the number of states with actual outbreaks of HPAI, which is the sensitivity of the system was 15.4% while the proportion of states with reported cases that actually had the virus in LBMs, which is the positive predictive value was 66.7%.

Stability: LBMs has dedicated personnel and an operational structure but it has no structured funding procedures as it is mainly donor driven.

Discussion

The LBMS surveillance system has helped in the generation of data on LBMs, their operations, biosecurity practices and the role they play in the epidemiology of H5N1 in Nigeria. It also identified markets that could be potentially exposed to HPAI. It has also highlighted the need for New Disease surveillance in Nigeria as an integral part of Avian influenza control. The avian influenza epidemic in Nigeria started in January 2006 and seems to have come to an end in October 2008 with 2% surveillance positivity compared to the number of states with actual outbreaks of HPAI, which is the sensitivity of the system was 15.4% while the proportion of states with reported cases that actually had the virus in LBMs, which is the positive predictive value was 66.7%.

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Competing interests

The authors declare no competing interests.

Authors’ contributions

All the authors have contributed to this articles in ways that conform to ICMJE authorship criteria. All the authors have read and approved the final version of the manuscript.

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