



Highly pathogenic avian influenza (HPAI A H5N1) outbreak in Spain: its mitigation through the One Health approach – a short communication

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Abstract

Highly pathogenic avian influenza (HPAI A H5N1) has occurred over the past few years, especially during the 1918–1919 Spanish Flu pandemic, which wiped out many people in the world. It caused acute illness in about 25–30% of the world's population, which led to the deaths of up to an estimated 40 million people. Of recent, public health authorities in Spain reported the detection of avian influenza A in two poultry workers on a single farm, following an outbreak in poultry confirmed on 20 September which was likely to be due to exposure to infected poultry or contaminated environments and poor interprofessional collaborations among the Spanish health workers. This is a public health challenge for the Spanish government and the world at large. Thus, we believed that through the One Health approach in Spain, there would be a stop to and prevention of further spread of the recent outbreak of avian influenza A in Spain, as well as other infectious diseases and future outbreaks in the country and the world at large.

Keywords: animals, humans, global health, one health, highly pathogenic Avian influenza

Introduction

Highly pathogenic avian influenza (HPAI A H5N1) is a form of zoonotic disease caused by the influenza A virus^[1]. HPAI A H5N1 has occurred over the past few years, most notably the 1918–1919 Spanish flu pandemic, which wiped out millions of the world's population and caused acute illness in about 25–30% of the world's population, which led to the death of up to an estimated 40 million people^[2]. The current 2021–2022 epidemic is widespread in Europe and is even more extensive than the previous 2016–2017 and 2020–2021 epidemics, with a northern limit from Iceland to northern

Norway (including the Norwegian islands of Svalbard and Jan Mayen) and the southern limit in Portugal and Spain^[3]. This current outbreak of avian influenza A in Spain is of great concern, as we feared that another pandemic might be on the way. As there is no evidence of human-to-human transmission of the avian influenza A virus in this event that has been identified to date, our present study shows the One Health approach that the Spanish government could adopt in mitigating and preventing the further spread of HPAI H5N1 in Spain^[3].

Main text

Current situation of avian influenza A outbreak in Spain

Since the year 1996, the HPAI H5N1 strain of avian influenza has been circulating in different continents, including Europe, where, in 2005, Croatians and Romanians were the first victims. H5N1 was first confirmed in Basque Country in Northern Spain^[4]. From 2003 to 21 October 2022, a total of 868 human cases of infection with HPAI H5N1, including these two cases, and 456 deaths have been reported globally from 21 countries. A total of three human cases of infection with HPAI H5N1, one from the United Kingdom in 2021 and two from Spain in 2022 have been reported in Europe to date. On 27 September 2022, the Ministry of Public Health of Spain notified the WHO of a case of HPAI H5N1 in an individual working at a poultry farm in the province of Guadalajara, Spain. An outbreak of HPAI H5N1 in poultry was confirmed on the farm on 20 September 2022, while transmission of the virus from birds to humans is possible but rare, evidence of human-to-human transmission is inconclusive^[3].

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Etiology and clinical manifestation of avian influenza A

Highly pathogenic avian influenza (HPAI A H5N1), according to the World Organization for Animal Health, is defined as an infection of poultry caused by any influenza A virus of the H5 or H7 subtypes or by any influenza A virus^[5]. This virus has an intravenous pathogenicity index greater than 1.2 (or, as an alternative at least 75% mortality)^[5]. This virus is a negative strand RNA virus of the genus *Orthomyxoviridae*^[2]. It continually circulates in humans in yearly epidemics (mainly in the winter in temperate climates), and antigenically novel virus strains emerge sporadically as pandemic viruses. High pathogenicity avian influenza viruses have an intravenous pathogenicity index in 6-week-old chickens greater than 1.2 or, as an alternative, cause at least 75% mortality in 4- to 8-week-old chickens infected intravenously^[5]. The natural reservoirs are aquatic birds; transmission between birds occurs directly or indirectly through fecal-contaminated aerosols, water, feeds, and other materials. From the principal reservoirs of aquatic birds, viruses are occasionally transmitted to other animals, including humans, causing outbreaks, and transmission of virus may also occur among the new host, example human to human^[6].

For HPAI H5N1 infection, evidence has shown that transmission can occur at three levels, that is, from bird-to-human, as evidence has shown an increase in the disease among individuals who handle infected poultry or eat the blood or undercooked poultry; environment-to-human, via ingestion of contaminated water, swimming, or direct inoculation into the conjunctiva; and human-to-human transmission is limited^[3].

The virulence of the virus is associated with the glycoproteins protruding from the lipid envelope, and these are hemagglutinin and neuraminidase (NA). The hemagglutinin attaches to the cell surface sialic receptors, and this facilitates entry of the virus into the host cells, while the NA catalyzes the cleavage of glycosidic linkages to sialic acid on the host cell and virion surfaces, and this glycoprotein prevents the aggregation of the virion, thus facilitating the release of progeny virus from infected cells. The third is membrane protein (M2 protein), which functions as an ion channel; this protein regulates the internal hydrogen potential of the virus, which is essential for uncoating the virus during early replications^[6]. Upon infection of the respiratory epithelium, the human influenza strain preferentially binds to sialic acid residue linked to galactose by alpha-2,6 linkage, while avian and equine influenza strains recognize sialic acid linked to galactose by alpha-2,3 linkage^[6,7]. Correspondingly, human respiratory epithelial cells predominantly alpha-2,6 sialic acid galactose linkages, while the host cells in birds and horses mostly contain alpha-2,3 linkages. The pig is known to contain two types of linkages, which explains why it is susceptible to both human and avian influenza viruses, and can therefore serve as a source of a pandemic strain^[7].

Most cases of HPAI H5N1 infections at presentation were characterized by severe influenza syndrome, which cannot be differentiated clinically from severe human influenza and has symptoms of fever, cough, shortness of breath, and radiologic evidence of pneumonia^[7]. Chest radiography abnormalities show extensive bilateral infiltration, lobar collapse, focal consolidation, and pulmonary damage, which are seen even after several months of the illness. Large numbers of patients also complain of gastrointestinal symptoms such as diarrhea, vomiting, and abdominal pain. In severe cases, patients with HPAI H5N1

present with severe bilateral pneumonia, necessitating ventilatory support. Complicated cases of HPAI H5N1 could present with acute respiratory distress syndrome, renal failure, and multiorgan failure^[2].

Implications and current efforts to fight avian influenza A

On the other hand, the concept of ‘One Health’, has been defined as the collective effort of interprofessionalism in order to obtain optimal health for people, animals, and our ecosystems. A concept that is so appealing that it has gained traction worldwide. In recent times, studies have shown that many countries, especially the Sub-Saharan countries and some parts of Europe, including Spain, lack knowledge of the One Health approach to tackle zoonotic infections, which leads to greater vulnerability in the spread of infections and outbreaks, for example, avian influenza A, and setbacks in reducing the spread of these diseases among community members and in the ecological system at large. Using a One Health approach, zoonotic diseases can be prevented from occurring, and if they do occur, the administration of good treatment to both the infected animals and human beings can promote health in animals, humans, and environmental life^[8].

Avian influenza outbreaks can have heavy consequences for the poultry industry, the health of wild birds, farmer’s livelihoods, and international trade. However, another influenza pandemic is inevitable^[1]. Work on a pandemic vaccine continues in several countries, but the true efficacy of a vaccine will become apparent only when it is used. Supply is also an issue: clinical trials suggest that current vaccine production would be unable to provide enough doses for the global population in the event of a pandemic.

The current public health response by WHO includes coordination and response, surveillance, laboratory virus characterization and serological studies, and infection prevention and control. Also, the National Strategy to Safeguard Against the Danger of Pandemic Influenza (White House) outlines the coordinated federal government efforts to prevent and prepare for avian and pandemic flu. The Global Influenza Strategy for 2019–2030 developed by WHO provides a framework for WHO, countries, and partners to approach influenza holistically through tailored national programs from surveillance to disease prevention and control with the goal of strengthening seasonal prevention and control and preparedness for future pandemics.

Recommendations

To mitigate the recent outbreak of HPAI H5N1 in Spain, it is necessary and important for the Spanish government to adopt the proper control measures. These measures, with an emphasis on the One Health approach, include proper and well-treatment integrations among the Spanish physicians (infectious disease experts), the veterinary doctors, the nurses, the pharmacists, the social, and community health workers, as well as the religious leaders in the Spanish communities, in awareness campaigns about the infection, a well-supervised contact tracing, food and personal hygiene, animal care, emergency preparedness, as well as appropriate and suitable samples taken from confirmed cases for testing and diagnosis of influenza according to standard treatment guidelines. Considering the high negative impact of HPAI epidemics in recent years and the ongoing risk of HPAI posed by the sustained virus circulation in wild birds, short-term preparedness and medium-term and long-term prevention

strategies should be identified and implemented, primarily in densely populated poultry areas and poultry production systems that are highly susceptible to avian influenza exposure^[3].

Appropriate and suitable samples should be taken from confirmed cases for testing and diagnosis of influenza according to standard guidelines. Suspected and infected cases should be treated with NA inhibitors. As we know that adamantane antiviral drugs are not recommended for monotherapy because of resistance in A(H5) and A(H7N9) viruses against these agents, as well as routine use of corticosteroids is not recommended due to its immunosuppressive effect that may lead to bacterial superinfections, personal protective measures as a method of the One Health approach should be ensured among the Spanish health workers, including proper hand washing, proper respiratory hygiene, self-isolation in case of any symptoms, avoiding close contact with infected people, and avoiding use of poultry products in affected areas.

Further, travelers should avoid visiting any area that has suspected cases to prevent global spread. Quality surveillance is essential to lowering the public health threat. According to recommendations from the Center for Disease Control, everyone older than 6 months should get the seasonal flu vaccine once a year to minimize the effect of virus^[10].

Currently, there is no vaccine to protect against avian influenza in humans. WHO recommends that all people involved in work with birds have a seasonal influenza vaccination. General precautions include regular hand washing and good food safety and hygiene practices. Should infected individuals from affected areas travel internationally, their infection may be detected in another country during travel or after arrival. If this were to occur, further community-level spread is considered unlikely as this virus has not acquired the ability to transmit easily among humans.

Moreso, the wandering of stray dogs and scavenging ducks should be restricted by the use of protective fences around farms in the country. Farmers in Spain from surrounding poultry farms should follow precautionary measures before entering chicken sheds^[11]. Facilities for hand washing and foot washing should be available at farms. Further proper disinfection and cleaning of vehicles should be confirmed before their entrance into farms, and vehicles must be parked at a considerable distance of 30 m from the farm^[12]. Litter should be cleaned daily, and dead birds should be buried deep to minimize the risk of spreading H5 and H7^[11]. As restricted financial resources limit the implementation of enhanced biosecurity on farms, funding and aid must be provided to the farmers from the government^[13]. Farmers in Spain should be educated to improve biosecurity and choose the right production input suppliers without causing huge financial issues.

Furthermore, there should be prompt and well-implemented participatory disease surveillance (PDS) in Spain regarding the prevention of HPAI H5N1^[14]. As we all know, that PDS, first developed as part of the Global Rinderpest Eradication Programme as a tool to locate the foci of rinderpest in remote areas is a crucial component of all government veterinary services^[15,16]. PDS evolved as a method of active disease surveillance for application to a range of animal health problems in both rural and urban settings^[16,17]. And it is of the utmost importance for animal disease emergency preparedness, particularly for diseases like HPAI H5N1. This is significant for early warning of the disease, planning and monitoring of the HPAI H5N1 control programme, provision of sound animal health advice to farmers, certification of the export of livestock/livestock

products, international reporting, and evidence of freedom from diseases^[18,19]. PDS would also revitalize veterinary interactions with livestock owners and lead to more customer-driven animal health services and policies in Spain^[20].

All these recommendations and control measures still point to and emphasize the importance of a One Health approach in the fight against this current outbreak of HPAI H5N1 as well as other infectious diseases and future outbreaks in Spain and the world at large^[18–20].

Conclusion

The recent outbreak of HPAI H5N1 in Spain is a public health challenge for the Spanish government and the world at large. This necessitates urgent attention and immediate control strategies. We therefore urge the Spanish Ministry of Health to adopt the One Health approach to the control and future recurrence of the flu. This approach has been proven to be effective in disease control and the prevention of outbreaks.

Ethical approval

Not applicable.

Consent

As the information used in this study does not include any identifying information from the patients, written consent from the patients was not required.

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Author contribution

A.A.: conceptualization. M.O.: supervision. G.M., A.A., M.O.O., and H.C.: manuscript preparation. H.A.Y., A.Z.Z., and C.B.: manuscript editing. S.B., A.N.A., A.F., and A.N.: manuscript review. Final approval of manuscript done by all Authors.

Conflicts of interest disclosure

The authors have no competing interests to declare that are relevant to the content of this article.

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