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# Avian Influenza in India – Epidemiology, Outbreaks, and Diagnostic Capabilities

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***Abstract*: Bird flu is a serious concern in the present day because of the different strains of the avian influenza virus. This virus is getting stronger every day by exploiting its family by mutating its genes and creating new varieties of viruses. The primary target of the virus is always a species from bird families, especially chickens and ducks, which are consumed by humans and are the biggest concern. It's easy to spread the influenza virus to humans from birds, though India has well-equipped lab setups across the country still there is no such cure for the periodic reappearance of Bird flu.**

***Keywords*: Avian Influenza, Diagnostic Capabilities, India, Epidemiology, Outbreaks, H5N1.**

## 1. Introduction

Bird flu is also known as avian influenza and mostly spreads among birds, but sometimes spreads to humans. It can affect the respiratory system and the causative virus in humans is influenza A virus variants H5N1 virus and H7N9 virus.

It rarely spreads from birds to humans. Bird flu is a recurring issue in India due to its significant effect on poultry industries and public health. This paper aims to analyze the preparedness for recurring Bird flu in India.

### *A. History of Avian Influenza in India (see Table 1)*

The first significant outbreak of avian influenza was reported in India in 2006. Since then, several outbreaks have occurred in the country, with varying impacts on poultry and sometimes humans The main strains of the H5N1, H9N2 and H5N8 are the most common viruses identified in India.

### *B. 2006-2007 Outbreak*

The first major H5N1 outbreak occurred in Maharashtra and Gujarat. It led to the slaughter of many chickens to contain the virus and prevent its spread.

### *C. Outbreaks in 2011*

West Bengal, Assam and Tripura were heavily impacted by the H5N1 outbreak, leading to thousands of bird culls and numerous surveillance measures

### *D. 2014-2015 Outbreak*

H5N1 outbreak has been reported in several states including Kerala, Telangana and Rajasthan, necessitating stringent biosecurity measures and culling operations [4].

### *E. Pandemic Outbreaks in 2020-2021*

A spectacular pandemic of H5N8 and H5N1 has affected several states including Kerala, Haryana and Rajasthan, causing the death of millions of birds, which have killed millions of birds -Millions of birds have been killed several Poultry production in India: India is one of the World's largest producers of eggs and broiler meat and nearly 30 million farmers are engaged in backyard poultry as per the 19th Livestock Census [5].

The top egg-producing state as of the year 2022-2023 in India is Andhra Pradesh (20.13%). Other states that greatly contribute to egg production are Tamil Nadu, Telangana, Bengal and Karnataka. The major states producing the most portion of the

Table 1
Bird flu affected states in India

| State | Year of Major Outbreaks | Virus Strain | Human Deaths Notified |
|---|---|---|---|
| Maharashtra | 2006 - 2007 | H5N1 | 0 |
| Gujarat | 2006 - 2007 | | 0 |
| West Bengal | 2011, 2021 | | 0 |
| Assam | 2011 | | 0 |
| Tripura | 2011 | | 0 |
| Kerala | 2014 - 2015, 2020 - 2021 | H5N1, H5N8 | 0 |
| Telangana | 2014 - 2015 | H5N1 | 0 |
| Rajasthan | 2014 - 2015, 2020 - 2021 | H5N1, H5N8 | 0 |
| Haryana | 2021 | H5N1 | 1 |
| Madhya Pradesh | 2021 | H5N1, H5N8 | 0 |
| Himachal Pradesh | 2021 | H5N1, H5N8 | 0 |
| Uttar Pradesh | Various years | H5N1 | 0 |
| Punjab | 2021 | H5N1 | 0 |
| Odisha | 2020 - 2021 | H5N1, H5N8 | 0 |
| Chhattisgarh | 2020 - 2021 | H5N1, H5N8 | 0 |

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poultry meat of India are Bengal, Maharashtra, Tamil Nadu, Telangana and Uttar Pradesh [6]. (See Figure .1)

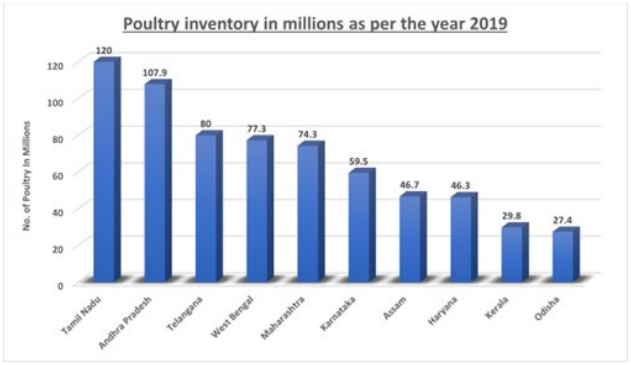


Fig. 1. Poultry inventory in India as per the year 2019

The Consumption of meat is also high in a similar state, the poultry market is enlarging day by day and we can see various kinds of different types of viruses associated with birds spreading and the greatest medium is poultry or other types of bird species, example- H5N1, H7N7, H5N8, H7N9, HPAI, H9N2. Of these different types, the most common ones are H7N7 and H5N1 in humans, the most common and the deadliest strain always comes from H5N1.

## 2. Common Strains of Bird Flu Virus Affecting India

### *A. H5N1*

This virus is also known as highly pathogenic Asian Avian Influenza A. Nearly 700 infections have been reported from Asia, Africa, the pacific, Europe and the near east since 2003.The highest number of human cases were reported from Indonesia, Egypt and Vietnam. The first case was reported on 8 January 2014 in Canada in a person who had returned from China [1]. H5N1 Virus affecting the respiratory tract of humans and can cause illness and death in some cases. Most of the death is due to pneumonia and respiratory failure. Mostly it affects children and less than 40 years age group. Fatality is higher in the age group between 10 -19 years and in young adults.H5N1 caused the largest detection and death in humans. As per the literature, most of the human-to-human spreading occurred between family members who had a very long period of unprotected close contact [2]. The virus did not show an easy spread from person to person and the infection reported was due to exposure to live poultry or staying in a highly contaminated area with this virus.

### *B. H5N8*

It was detected only in poultry.

### *C. H7N9*

This Virus is also known as Avian Influenza A. Before 2013, it was not found in any animals or people other than birds. It was reported other than in birds in China [3].

### *D. H9N2*

It is also known as low pathogenic avian influenza (LPAI) which can occasionally infect humans.

## 3. Who is at Risk?

Those people in poultry farming can be at risk. also, the travellers who usually travel to the affected areas. If somebody is exposed to infected birds can be at risk. People who are consuming undercooked eggs or poultry may have a chance of getting the infection. Another group is healthcare workers, those who care for the infected person are also at risk of getting the disease. Somebody who may live with an infected person is also at risk of getting the disease [8].

### *A. Most Recent States Affected by Bird Flu are (see Fig. 2)*

1) *Kerala*: There is frequent hit of bird flu in this region due to high and dense poultry population and nearness to migratory bird routes.
2) *Haryana*: Reported the first human case of H5N1 in 2021[4].
3) Rajasthan (out breaks in 2021)
4) Madhya Pradesh (out breaks in 2021)
5) Himachal Pradesh (Outbreaks in 2021)
6) West Bengal: H5N1 and H9N2 out breaks [9]


Fig. 2. Indian states currently at risk [3], [9], [10], [12]

### *B. Testing Laboratories*

India has established a network of laboratories for diagnosing avian influenza, including:

1) National Institute of High-Security Animal Diseases (NIHSAD), Bhopal: The premier facility for testing avian influenza.
2) National Institute of Virology (NIV), Pune: A key centre for diagnosing and subtyping influenza viruses.

Table 2
Upcoming expected strains of bird flu in India [4], [9], [13]-[15]

| Virus Strain | Characteristics | Basis for Expectation |
|---|---|---|
| H5N1 | Highly pathogenic, significant human fatality rate | Previous outbreaks in India, ongoing presence in poultry populations |
| H9N2 | Mild pathogenicity in humans, prevalent in poultry | Recent human infections in West Bengal, ongoing surveillance |
| H5N8 | Highly pathogenic in birds, not known to infect humans | Significant outbreaks in poultry in recent years |
| H7N9 | Severe respiratory illness in humans, high mortality | Emerging concerns in global surveillance, potential pandemic risk |

3) Regional Disease Diagnostic Laboratories (RDDLs): Spread across various regions, these labs support state-level testing and diagnosis.
4) State Veterinary Laboratories: Each state has its labs that conduct preliminary testing before sending samples to national labs for confirmation [10]

### *C. Upcoming Expected Strains of Bird Flu in India*

Based on recent trends and expert analyses, several strains of bird flu (avian influenza) are anticipated to be of particular concern in India over the upcoming years. Here is a table summarizing the expected strains, their characteristics, and the basis for these expectations (See Table 2).

## 4. Conclusion

Bird flu remains a critical concern in India, impacting both the poultry industry and public health. Effective surveillance, rapid response, and a robust network of diagnostic labs are essential to managing and mitigating the impact of avian influenza. Continued vigilance and adherence to biosecurity measures are crucial in preventing future outbreaks and ensuring the safety of both humans and birds.

## Conflict of Interest

The Authors declare No Conflict of Interest related to the publication of this article.

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## References

[1] Archived: Highly Pathogenic Asian Avian Influenza A(H5N1) in People | Avian Influenza (Flu) [Internet]. 2023. Available from: https://archive.cdc.gov/www_cdc_gov/flu/avianflu/h5n1-people.htm
[2] Ungchusak K, Auewarakul P, Dowell SF, Kitphati R, Auwanit W, Puthavathana P, et al. Probable person-to-person transmission of avian influenza A (H5N1). N Engl J Med. 2005 Jan 27;352(4):333–40.
[3] Avian influenza A (H7N9) virus outbreak [Internet]. Available from: https://www.who.int/emergencies/situations/avian-influenza-a-(h7n9)-virus-outbreak
[4] Human infection with avian influenza A(H5N1) India [Internet]. Available from: https://www.who.int/emergencies/disease-outbreak-news/item/human-infection-with-avian-influenza-a(h5n1)-India
[5] Praharee TP. STATUS OF POULTRY PRODUCTION IN INDIA | Pashudhan Praharee [Internet]. 2019. Available from: https://www.pashudhanpraharee.com/status-of-poultry-production-in-india/
[6] eFeedLink - The state of India's poultry meat and egg market in 2023 [Internet]. Available from: https://m.efeedlink.com/contents/01-29-2024/d58343b5-59d0-4bc3-bfd0-288de340afcd-a001.html
[7] India: poultry inventory by leading state | Statista [Internet]. Available from: https://www.statista.com/statistics/622738/poultry-inventory-by-state-india/
[8] Kanwar S. Bird Flu in India: WHO's Golden Rules, Symptoms, Causes, Prevention [Internet]. Y20 India. 2024. Available from: https://y20india.in/bird-flu/
[9] India: Avian Influenza Outbreaks in Several Indian States | USDA Foreign Agricultural Service [Internet]. 2021. Available from: https://fas.usda.gov/data/india-avian-influenza-outbreaks-several-indian-states
[10] Avian Influenza A (H9N2)- India [Internet]. Available from: https://www.who.int/emergencies/disease-outbreak-news/item/2024-DON523
[11] India Today [Internet]. Latest News, Breaking News Today - Entertainment, Cricket, Business, Politics – India Today. Available from: https://www.indiatoday.in/
[12] Drishti IAS [Internet]. Bird Flu: Avian Influenza. Available from: https://www.drishtiias.com/daily-updates/daily-news-analysis/bird-flu-avian-influenza
[13] India Today [Internet]. 2024. WHO confirms second human case of H9N2 bird flu in India: All about this strain. Available from: https://www.indiatoday.in/health/story/who-confirms-second-human-case-of-h9n2-bird-flu-in-india-all-about-this-strain-2552174-2024-06-12
[14] Human infection with avian influenza A(H7N9) virus – China: Update [Internet]. Available from: https://www.who.int/emergencies/disease-outbreak-news/item/05-september-2018-ah7n9-china-en
[15] Influenza A virus subtype H7N9. In: Wikipedia [Internet]. Available from: https://en.wikipedia.org/w/index.php?title=Influenza_A_virus_subtype_H7N9&oldid=1230823915