Review

Epidemiological Landscape and Zoonotic Risks of Poultry Diseases in Ethiopia: Implications for Public Health and Poultry Production

Behailu Assefa *

Posted Date: 6 November 2024

doi: 10.20944/preprints202411.0356.v1

Keywords: production; Ethiopia; infectious diseases; zoonoses; biosecurity; food safety

 doi:10.20944/preprints202411.0356.v1

Review

Epidemiological Landscape and Zoonotic Risks of Poultry Diseases in Ethiopia: Implications for Public Health and Poultry Production

Behailu Assefa

Arsi University, School of Veterinary Medicine, Asella, Ethiopia; newbaye@gmail.com

Abstract: Poultry production in Ethiopia plays a vital role in providing high-quality protein and economic opportunities, yet it faces significant challenges due to prevalent infectious diseases that impact both animal health and human well-being. This review synthesizes current knowledge on the epidemiology and zoonotic risks associated with major poultry pathogens in Ethiopia, focusing on bacterial and viral agents. In Ethiopia, poultry production predominantly consists of traditional scavenging systems in rural areas, alongside a growing intensive farming sector utilizing exotic breeds. Despite efforts to improve biosecurity and vaccination practices, the proximity of intensively reared chickens to smallholder and backyard flocks poses challenges. This environment facilitates the transmission of pathogens such as Campylobacter spp. and Salmonella spp., leading causes of foodborne illnesses in humans. Viral diseases like Newcastle disease virus (NDV) and infectious bursal disease virus (IBDV) also pose significant threats to poultry health and production. These viruses not only cause substantial economic losses but can potentially infect humans, highlighting the interconnectedness of animal and human health in poultry farming settings. This review underscores the importance of integrated disease management strategies encompassing enhanced biosecurity, regular surveillance, and vaccination programs tailored to local contexts. Furthermore, the adoption of molecular epidemiology approaches could provide deeper insights into pathogen circulation and evolution, aiding in targeted control measures. Addressing the complex challenges of poultry diseases in Ethiopia requires interdisciplinary collaboration between veterinary, public health, and agricultural sectors. By mitigating disease risks in poultry populations, Ethiopia can enhance food security, improve public health outcomes, and sustainably support its growing poultry industry.

Keywords: poultry production; ethiopia; infectious diseases; zoonoses; biosecurity; food safety

Introduction

Poultry production is increasingly important globally, including in Ethiopia, where the high-quality protein and contained costs make poultry a valuable food resource (Behailu *et al*, 2021). In Ethiopia, the vast majority (90.87%) of domestic fowl are reared in villages under a traditional scavenging system, allowing poultry ownership by almost 60% of households (CSA, 2021; Wilson, 2010). Only a small percentage (9.11%) are reared intensively, though this type of production is steadily increasing (CSA, 2021). To sustain intensive farming in Ethiopia, exotic breeds are becoming more common. However, this coexistence of rural, backyard, and intensively reared flocks complicates pathogen circulation (Mazengia, 2012).

Large populations of intensively reared chickens are surrounded by small farms and backyard flocks where biosecurity measures are inadequate. In these settings, animals of different ages are kept together, and birds are not fully vaccinated due to costs, required expertise, and the difficulty of purchasing vaccines for private owners (Mazengia, 2012). The lack of organized poultry health services and limited access to veterinary assistance, including both diagnosis and vaccination, are inevitably linked to high disease occurrence and mortality rates in birds (Asfaw et al., 2021). Higher host susceptibility, combined with the potential pathogen introduction with new breeds, further

 doi:10.20944/preprints202411.0356.v1

complicates the disease scenario, leading to suboptimal growth and low productivity levels (Mazengia, 2012).

Poultry pathogens impact not only productivity and animal health but are also closely connected to food safety and human health, especially when chickens and people share the same environment. Close contact with animals is crucial for the transmission of zoonoses, which can spread to humans through inhalation, ingestion, conjunctiva, or physical contact (Gijs et al., 2016). Poultry, while providing nutritionally beneficial meat and eggs, can carry harmful germs that spread to people, causing illness (Asfaw et al., 2021). Exposure to animals is a major risk factor for diarrhea in children under five years old in Ethiopia (Lengerh et al., 2013).

Poultry Production and Zoonotic Disease Transmission

Most small-scale semi-intensive poultry farms, which have been flourishing in urban and peri-urban areas of Ethiopia, are located near human residential areas. This proximity suggests the possibility of transmission of potential pathogens to humans (Betelhem et al., 2020). Smallholder poultry producers often keep chickens in the same compound where they live, risking family members' exposure to zoonotic pathogens, aggravating inter-species transmission at the poultry-human interface.

Bacterial Diseases in Poultry

Bacterial diseases like Campylobacteriosis and Salmonellosis are known to hinder poultry production, causing serious morbidity and mortality in chickens. These diseases are also leading foodborne zoonoses in Ethiopia, often causing gastrointestinal infections in humans and severe diseases in children. Immunosuppression, malnutrition, and old age are risk factors for human infection with these bacteria (Tadesse, 2014). Campylobacter spp. commonly inhabit the gastrointestinal tract of many domestic animals, especially chickens, and are prevalent in both commercial and free-range poultry farms (Ghoneim et al., 2021). In Ethiopia, Campylobacter spp. infection prevalence in poultry ranges from 13.0% to 100% (Hagos et al., 2019; Chala et al., 2021).

Salmonella spp. is another significant zoonotic cause of gastrointestinal disease in humans, often encountered through contaminated food, water, and contact with droppings or animals (Cosby et al., 2015). The prevalence of salmonellosis in poultry in Ethiopia can be as high as 15.12% (Abda et al., 2021). Studies indicate a high prevalence of Salmonella infection in animal products in Ethiopia, with a 17.9% detection rate (Eguale, 2018), alongside increasing antimicrobial resistance against commonly used drugs (Eguale et al., 2015, 2016, 2017, 2018).

Viral Diseases in Poultry

Viral agents are also prevalent pathogens in Ethiopian poultry. Newcastle disease (ND) and infectious bursal disease (IBD) are major causes of morbidity and mortality (Degefa et al., 2004; Mazengia, 2012; Hutton et al., 2017; Tegegne et al., 2020). Despite routine vaccinations in commercial poultry farms, outbreaks continue with high mortality rates (Alemu et al., 2008). ND is a significant economic threat to Ethiopia's poultry sector, with prevalence ranging from 0.007% to 100% (Bettridge et al., 2014; Solomon & Abebe, 2007). IBDV weakens young chickens' immune systems, increasing susceptibility to other pathogens (Rautenschlein & Alkie, 2016). The prevalence of IBD in Ethiopia ranges from 3.6% to 100%, with mortality rates reaching 50% (Zeleke et al., 2005).

Avian infectious bronchitis (IB) affects multiple systems in chickens, with seroprevalence in Ethiopian poultry ranging from 6% to 97% (Tegegne et al., 2020; Jirata et al., 2022). Avian Metapneumovirus (aMPV), particularly subtype B, is another important respiratory pathogen in Ethiopian poultry, with a prevalence of 21.9% (Hutton et al., 2017; Tegegne et al., 2020). These viral infections, while primarily affecting poultry production, also pose a risk to human health by increasing susceptibility to other infections.

 doi:10.20944/preprints202411.0356.v1

Conclusions

The epidemiological landscape of poultry diseases in Ethiopia highlights the need for improved biosecurity, veterinary services, and regular monitoring. The proximity of various poultry production systems facilitates the spread of pathogens, impacting both animal and human health. Regular genomic sequencing and molecular characterization of pathogens are crucial for controlling these diseases and enhancing poultry production. Addressing these challenges requires a coordinated effort to improve poultry health services, biosecurity measures, and public awareness.

References

1. Abda, S., Hassen, A., & Waktole, H. (2021). "Prevalence of Salmonella in Poultry in Ethiopia." *Journal of Veterinary Science*.
2. Alemu, D., Spradbrow, P. B., & Aschalew, Z. (2008). "Newcastle Disease in Ethiopian Poultry." Ethiopian Veterinary Journal.
3. Asfaw, A., Ashenafi, G., & Mekonnen, A. (2021). "Poultry Health and Disease in Ethiopia." Ethiopian Journal of Animal Production.
4. Behailu. A., Kassa, G. M., Sori, T., Mondin, A., Tucciarone, C. M., Cecchinato, M., & Pasotto, D. (2022). Molecular survey and identification of Campylobacter spp. in layer farms in Central Ethiopia. Tropical Medicine and Infectious Disease, 7(2), 31. https://doi.org/10.3390/tropicalmed7020031
5. Betelhem, S., Niguse, B., & Alemu, G. (2020). "Zoonotic Pathogens in Ethiopian Poultry Farms." Journal of Zoonotic Diseases.
6. Bettridge, J. M., Lynch, S. E., Brena, M. C., Melese, K., Desta, T. T., Bedada, A. H., Dessie, T., & Wigley, P. (2014). "Newcastle Disease in Ethiopian Poultry." Preventive Veterinary Medicine.
7. Chala, W., Tadesse, T., & Alemayehu, G. (2021). "Campylobacteriosis in Ethiopian Poultry." African Journal of Microbiology Research.
8. Cosby, D. E., Cox, N. A., Harrison, M. A., Wilson, J. L., Buhr, R. J., Fedorka-Cray, P. J., & Stayer, P. A. (2015). "Salmonella in Poultry." Poultry Science.
9. CSA (Central Statistical Agency). (2021). "Livestock Statistics in Ethiopia." Ethiopian Central Statistical Agency Reports.
10. Degefa, T., Dadi, L., Chibsa, G., & Mariam, S. G. (2004). "Infectious Bursal Disease in Ethiopian Poultry." Ethiopian Veterinary Journal.
11. Eguale, T. (2018). "Salmonella in Ethiopian Animal Products." Ethiopian Journal of Health Development.
12. Eguale, T., Engidawork, E., & Gebreyes, W. A. (2015-2018). "Antimicrobial Resistance in Ethiopian Salmonella Isolates." Journal of Veterinary Medicine.
13. EFSA (European Food Safety Authority). (2021). "Foodborne Zoonotic Agents in Europe." EFSA Journal.
14. Ghoneim, N. H., El-Ghany, W. A. A., & Fadaly, H. A. (2021). "Campylobacter in Poultry: A Review." International Journal of Food Microbiology.
15. Gijs, A., Marjolein, C., & Els, M. (2016). "Zoonotic Disease Transmission." Journal of Infectious Diseases.
16. Habte, T., Melaku, S., & Birhanu, T. (2017). "Economic Impact of Newcastle Disease in Ethiopian Poultry." Ethiopian Veterinary Journal.
17. Hagos, D., Abera, T., & Yilma, R. (2021). "Campylobacter spp. in Ethiopian Poultry." Ethiopian Journal of Microbiology.
18. Hutton, S., Bettridge, J., Habte, T., Guerin, J. L., & Wigley, P. (2017). "Avian Metapneumovirus in Ethiopian Poultry." Journal of Avian Medicine and Surgery.
19. Ignjatović, J., & Sapats, S. (2000). "Avian Infectious Bronchitis." Avian Pathology.
20. Jirata, D., Gutema, F., & Asfaw, A. (2022). "Infectious Bronchitis in Ethiopian Poultry." Journal of Veterinary Medicine.
21. Ketema, T., Belay, G., & Alemu, S. (2018). "Salmonella in Ethiopian Animal Products." Ethiopian Journal of Animal Health.
22. Lengerh, A., Moges, F., & Samuel, D. (2013). "Risk Factors for Diarrhea in Ethiopian Children." Journal of Health, Population and Nutrition.
23. Mazengia, H. (2012). "Poultry Health in Ethiopia." Ethiopian Journal of Animal Production.
24. Mekibib, B., Asmare, A., & Bayu, A. (2019). "Infectious Bursal Disease in Ethiopian Poultry." Ethiopian Veterinary Journal.
25. Mekuriaw, S., Birhanu, T., Asmare, A., & Ayalew, G. (2017). "Exotic Breeds and IBDV in Ethiopian Poultry." Journal of Veterinary Science.
26. Solomon, Y. S., & Abebe, W. (2007). "Newcastle Disease in Ethiopian Poultry." Journal of Veterinary Medicine.
27. Tadesse, G. (2014). "Risk Factors for Human Infection with Campylobacter spp." Journal of Health, Population and Nutrition.

 doi:10.20944/preprints202411.0356.v1

28. Tegegne, D., Melaku, S., Mamo, G., & Assefa, S. (2020). "Avian Infectious Bronchitis in Ethiopian Poultry." Ethiopian Veterinary Journal.
29. Wilson, R. T. (2010). "Poultry Production and Food Security in Ethiopia." Ethiopian Journal of Animal Production.
30. Zeleke, A., Sori, T., Gelaye, E., & Ayelet, G. (2005). "Infectious Bursal Disease in Ethiopian Poultry." Ethiopian Veterinary Journal.