



# Evaluation of factors associated with biosecurity, antimicrobial use and mortality in broiler farms in Northern Kerala

S. Femin<sup>1</sup>, R. Akash<sup>1</sup>, C. Sachin<sup>1</sup>, S.R. Sumayya<sup>1</sup>,



S. Aarathi<sup>1</sup> and P.M. Deepa<sup>2\*</sup>

Department of Veterinary Epidemiology and Preventive Medicine  
College of Veterinary and Animal Sciences, Pookode-673576 Kerala  
Veterinary and Animal Sciences University  
Kerala, India

Citation: Femin ,S., Akash, R., Sachin, C., Sumayya , S. R., Aarathi , S., and Deepa, P. M. 2023. Evaluation of factors associated with biosecurity, antimicrobial use and mortality in broiler farms in Northern Kerala. *J. Vet. Anim. Sci.* 54(2):583-588

DOI: <https://doi.org/10.51966/jvas.2023.54.2.583-588>

Received: 04.08.2022

Accepted: 28.01.2023

Published: 30.06.2023

## Abstract

A survey was conducted (March 2020 to October 2020) on biosecurity practices, disease occurrence and antimicrobial usage of 77 broiler farms from five districts of Northern Kerala. Data were collected through a questionnaire and field-level disease diagnostic tests were conducted. Biosecurity status varied from farm to farm with 97.4 per cent promoted vaccination and 61.04 per cent disposed carcasses by burning. However, limitations were observed in the use of a footbath, quarantine of new stock, isolation of diseased birds and quality of water. The five most common diseases recorded were Chronic respiratory disease (48.1%), Acute Death Syndrome (27.3%), Colibacillosis (23.4%), Pullorum (18.2%) and Coccidiosis (18.2%). The commonly used antibiotics in poultry farms were Enrofloxacin (35.1%), Cephalexin (14.3%), Tylosin (11.7%) and Levofloxacin (10.4%). Some of the farmers (14.3%) were unaware of the antibiotics used in their farms, a potent risk factor for the emergence of antimicrobial resistance. About 19.49 per cent of farms restricted antibiotic use and 44.15 per cent of farms supported herbal traditional medicines as an alternative to antimicrobials.

**Keywords:** Antimicrobial use, Broiler farms, Biosecurity, Kerala

One of the major constraints in the development of the poultry industry is the incidence of infectious diseases which caused high mortality in birds (Ebsa *et al.*, 2019). Poultry diseases have a catastrophic potential for quick spread under an intensive system of rearing as in large commercial stocks. To sustain the loss and achieve successful broiler production, there is a need to investigate the incidence and pathogenesis of broiler diseases. Antimicrobial resistance is a global public health threat. There is an increase in the emergence of multidrug resistance superbugs that can cause severe infections or even the death of the patient. Poultry is one of the most extensive types of meat consumed worldwide. There are reports of widespread use of antibiotics in poultry

1. BVSc scholars

2. Associate Professor and Head

\*Corresponding author: [deepapm@kvasu.ac.in](mailto:deepapm@kvasu.ac.in), Ph. 9496400982

Copyright: © 2023 Femin *et al.* This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

including colistin which is considered a last-resort antibiotic in humans. The indiscriminate use of antimicrobials in animal farming is likely to accelerate the development of antimicrobial resistance in pathogens, as well as in commensal organisms. In this context, the present study helps to understand the diseases affecting broiler birds in Northern Kerala, along with the epidemiological factors associated with it and understand antimicrobial usage in broilers.

This study was carried out in five districts of northern Kerala including Kannur, Wayanad, Kozhikode, Malappuram and Palakkad. The primary information and numbers of broiler poultry farms were obtained from the District Animal Husbandry office and local Veterinary Hospitals of which 77 commercial broiler farms with at least 500 broilers/farm were selected at random. A cross-sectional survey was carried out from March 22<sup>nd</sup> to October 27<sup>th</sup> 2020. Data were collected through a questionnaire; respondents were farm owners, farm managers and veterinarians. Data regarding feeding management, biosecurity practices, medication and prophylactic measures adopted in these farms were collected and analyzed by student's t-test. During our project period, mortality was reported in 11 farms in Wayanad and eight farms in Kozhikode districts. The birds of these farms were screened for gastrointestinal parasites/protozoa (by microscopic examination of faecal

samples), bacterial organisms (by culture and isolation from faecal samples collected using a sterile cloacal swab) and viral infections like bursal disease (IBD) and Newcastle disease (by lateral flow assay using Rapid IBDV Ag test kit (Bionote, Korea) and Rapid NDV Ag test kit (Bionote, Korea) respectively).

Our study revealed that most of the farmers had less than 10 years of experience in poultry farming. This highlights that commercial broiler production is an emerging livestock production sector in the current scenario. Mortality and disease outbreaks were common in these farms and antibiotic misuse was commonly seen among these farmers. They were unaware about the antibiotic resistance, proper biosecurity measures and disease diagnostics tool. In northern Kerala based on our survey, it was observed that the participation of the private sector is high and competitive in the poultry industry. General peculiarities of the poultry farms are presented in Table 1.

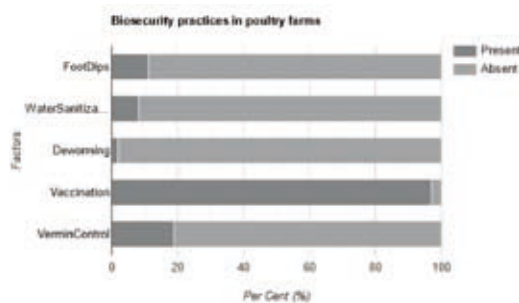
Biosecurity status varied from farm to farm and depended on the farming experience and capital (Fig. 1). Around 97.4 per cent of farmers had vaccinated their flock against prevalent poultry diseases such as IBD (Gamboro) and Newcastle disease. Out of 77 study farms in the present study, only 35 per cent of broiler farms were free from predators and rodents.

**Table 1:** Demographic characteristics of poultry farms

Characteristics		Frequencies	Percentage (%)
A) Based on Experience	<5 years	40	51.94*
	5-10 years	30	38.96
	11-15 years	3	3.89
	16-20 years	3	3.89
	>20 years	1	1.29
B) Flock Density	<1000 birds	6	7.82
	1000-5000	51	66.23**
	5000-10000	4	5.19
	>10000	16	20.77*
C) Type of farming	Intensive	77	100
D) Type of feed	Commercial	77	100
E) Source of Veterinary aid	Contract farming	49	63.63*
	Vet. Institution	18	23.37
	Self-help group	7	9.12
	Self	3	3.8

\*\* p< 0.01, \* p< 0.05

The results showed that most of the farms (86 per cent) did not have a secure boundary fence that could stop people and animals from intruding on the farm and 89.62 per cent of broiler farms did not use foot dips. Moreover, 95 per cent of broiler farms allowed visitors to the poultry farm. Sharma (2010) revealed that visitors could be a source of fomite transfer of many potentially devastating diseases. In this study, it was observed that the majority (64 per cent) of poultry farmers kept different age groups of chickens separately which is in accordance with Sainsbury (2000), who stated that different age groups should be placed separately to minimize the risk of disease spread.



**Fig. 1:** Common biosecurity practices adopted in farms

About 81.81 per cent of farms did not have a control plan for vermin. As far as the disposal of carcasses was concerned, the majority of the farmers were practising burning the carcasses (61.07 %), and 31.17 per cent used septic pits for disposal while 7.79 per cent did not have a proper disposal system. The majority of farmers disposed of used litter as a source of manure directly or after composting.

The diseases viz Chronic Respiratory Disease (CRD) (48.1%), Acute Death Syndrome (27.3%), colibacillosis (23.4%), pullorum disease (18.2%), coccidiosis (18.2%), infectious coryza (7.8%), IBD (5.2%) and Newcastle disease (3.9%) were reported in the study. Afsal *et al.* (2021) revealed that 56.5 and 67 per cent of cloacal samples from broilers were positive for *E. coli* from Kollam and Kottayam, respectively. Ozdemir (2020) reported that the most common disease outbreaks in farms were CRD (19.7%) and *E. coli* infections (14.8%). But Al Mamun *et al.* (2019) reported that the

prevalence of IBD was the highest (29.32 %) in broiler chickens which is not in agreement with our study. This might be due to effective preventive vaccination against this disease. The overall occurrence of *Eimeria* spp. in chicken from 12 different areas in and around Thrissur was 37.66 per cent (Pooja *et al.*, 2021). The present study revealed 3.9 per cent of cases were of ND in the study population. This finding agrees with the observations of Islam *et al.* (2003) and Al Mamun *et al.* (2019) who reported 6.73 per cent and 4.85 per cent of ND cases respectively. Acute death syndrome or sudden death syndrome (SDS) (27.3%) was observed in apparently healthy broiler birds ranging from 10 to 28 days of age in most of the farms. All birds that died of SDS were in good body condition and did not show any clinical signs. The pathogenesis of SDS in broilers is inadequately understood, but the evidence suggests that it might relate to broilers' high predisposition to cardiac arrhythmia. Fast-growing broilers had a high prevalence of cardiac dysrhythmia (Grashorn, 1994; Olkowski and Classen, 1998).

The uncontrolled use of antibiotics is playing a significant part in the emergence of resistant bacteria (Gossens *et al.*, 2005). The resistant bacteria in animals which might be due to antibiotic exposure can be transmitted to humans through meat consumption (Schneider and Garrett, 2009). This study was helpful to gain insight into farm management practices associated with antibiotic usage (Fig. 2). The commonly used antibiotics in poultry farms were Enrofloxacin (35.1%), Cephalexin (14.3%), Tylosin (11.7%) and Levofloxacin (10.4%). In the present study, 14.3 per cent of farmers were unaware of the antibiotics used in their farms which favours antimicrobial resistance. Most farms were multi-drug users and most of the farms used one or more antibiotics for therapeutic (43.63 %), prophylactic (50.91%) and to a lesser extent for growth promotion (5.45%). This report is concurrent with the values of Oluwasile *et al.* (2014) who reported that antibiotics were most commonly administered for therapy (36.2%) prophylaxis (29.3%) and growth promotion (7%). On the other hand, our result is contrary to a report from poultry farms in Ibadan, Nigeria which reported that 86

per cent of the poultry farms used antibiotics for growth promotion (Adelowo *et al.*, 2014). These reports indicated that farmers in different countries used antimicrobials in poultry for varying purposes. Also, the use of antibiotics for prevention was reported on large chicken farms in other developing countries such as Vietnam and Thailand (Carrique *et al.*, 2015; Wongsuvan *et al.*, 2018).

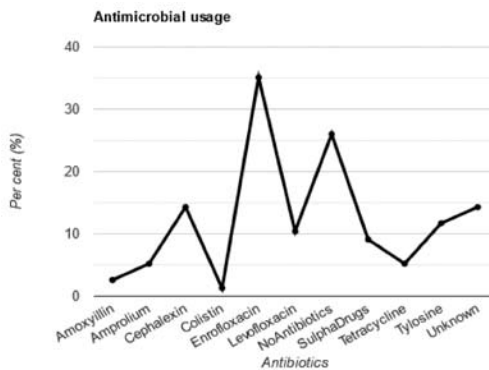


Fig. 2. Antimicrobial usage in broiler farms.

The survey found that Enrofloxacin and Cephalaxin were the most frequently used antibiotics in broiler farms in northern Kerala. Enrofloxacin is a Fluoroquinolone that has high activity on Gram-negative bacteria. It is used in poultry for bacterial enteritis caused by *E. coli* (Temmerman *et al.*, 2021) and *Salmonella*

causing white diarrhoea (Randall *et al.*, 2006), fowl cholera (Rawiwet *et al.*, 2010) and chronic respiratory disease (Sumano *et al.*, 1998). The present study showed that 44.15 per cent of farmers were using herbal traditional medicines to treat the diseases affecting birds.

Antibiotic use without proper diagnosis leads to inappropriate treatment and the development of resistant microorganisms. About 65.45 per cent of farms use antibiotics advised by a farm consultant or manager without a veterinarian's prescription (Table 2). A similar report by Amaechi (2014) during a study in Abia State, Nigeria where 70 per cent of farmers were treating the birds themselves with antibiotics without consultation of veterinary doctors. In the present study, only 18.18 per cent of farms rely on veterinary institutions for antimicrobials (Table 2). Antibiotic usage as per the advice of self-help groups had been observed (10.91%) (Table 2). The tendency to rely on personal experience for antibiotic use, dosage and withdrawal period could lead to improper antibiotic usage as reported by Zwald *et al.* (2004). About 90 per cent of the farmers did not know about the potential for antibiotic resistance transmission from animals to humans. This was in agreement with reports on the farmers in other developing countries

Table 2. Factors related to antibiotic usage in farms

Variables		Farms	Percentage (%)
A) Total farms using antimicrobial agents		62	80.51
B) Source of antimicrobial agents/information	Veterinary Institution	10	18.18
	Self-help group	6	10.91
	Contract agency	36	65.45
	Veterinary Medical/product shop	3	5.45
C) Reason for antimicrobial agents	To treat diseases	24	43.63
	To prevent diseases	28	50.91
	For growth promotion	3	5.45
D) Frequency of use of antimicrobial agents	During arrival of chicks	12	21.81
	When they are sick	32	58.18
	Others	11	20.00
E) Duration of usage	3- 5 days	41	74.55
	Indiscriminate usage	7	12.73
	Others	7	12.73
F) Traditional/herbal medication usages		34	44.15

such as Cambodia (Om and McLaws, 2016). In contrast, farmers from developed countries such as Germany had a higher level of awareness about the probable chance of transmission of antibiotic resistance between animals and humans (Schulze-Geisthovel *et al.*, 2016).

### Summary

The present study revealed that biosecurity practices in broiler farms in the selected areas of Northern Kerala were poor and lack of foot dips, improper water sanitization and free movement of people and animals in farms. Hence, awareness should be created among the farm owners and farm attendants about biosecurity practices. Death due to chronic respiratory disease, acute death syndrome, colibacillosis, pullorum disease, coccidiosis, infectious coryza, infectious bursal disease and Newcastle disease were reported in the study. Improving farm sanitation, especially on small and medium-sized farms, providing awareness about the judicious use of antibiotics to farmers, restricting over-the-counter availability as well as enforcing national regulations might lower antibiotic misuse and reduce the problem.

### Acknowledgement

The authors are thankful to the Kerala State Council for Science Technology and Environment for funding the student project (00298/SPS 64/2019/KSCSTE) entitled "Epidemiological evaluation of factors associated with antimicrobial use and mortality in broiler farms in Northern Kerala"

### Conflict of interest

The authors declare that they have no conflict of interest.

### References

- Adelowo, O.O., Fagade, O.E. and Agero, Y. 2014. Antibiotic resistance and resistance genes in *Escherichia coli* from poultry farms, southwest Nigeria. *J. Infect. Dev. Ctries.* **8**: 1103-1112.
- Afsal, S., Latha, C., Sethulekshmi, C., Binsy, M., Beena, C. J. and Gleeja, V.L. 2021. Occurrence of *Escherichia coli* in cloacal samples of broiler chicken from Kollam and Kottayam districts. *J. Vet. Anim. Sci.* **52**: 371-376.
- Al Mamun, M., Islam, M. and Rahman, M.M. 2019. Occurrence of poultry diseases at Kishoregonj district of Bangladesh. *MOJ Proteom. Bioinform.* **8**: 7-12.
- Amaechi, N. 2014. A Survey on Antibiotic Usage in Pigs and Poultry Birds in Abia State, Nigeria. *Glob. J. Bio. Agric. Health Sci.* **3**: 38-43.
- Carrique-Mas, J. J., Trung, N. V., Hoa, N. T., Mai, H. H., Thanh, T. H. and Campbell, J. I. 2015. Antimicrobial usage in chicken production in the Mekong Delta of Vietnam. *Zoonoses Public Health.* **62**: 70-78.
- Ebsa.Y.A., Harpal, S. and Negia, G.G. 2019. Challenges and chicken production status of poultry producers in Bishoftu, Ethiopia. *Poult. Sci.* **98**: 5452-5455.
- Goossens, H., Ferech, M., Vander Stichele, R., Elseviers, M. and ESAC Project Group. 2005. Outpatient antibiotic use in Europe and association with resistance: a cross-national database study. *Lancet.* **365**: 579-587.
- Grashorn, M. 1994. Investigation of the aetiology and pathology of sudden death syndrome in meat-type chickens. *Arch. Fur Geflugelkunde.* **58**: 243.
- Islam, M. R., Das, B. C., Hossain, K., Lucky, N. S. and Mostafa M G. 2003. A Study on the Occurrence of Poultry Diseases in Sylhet Region of Bangladesh. *Int. J. Poult. Sci.*, **2**: 354-56.
- Olkowski, A. A. and Classen, H. L. 1998. High incidence of cardiac arrhythmias in broiler chickens. *J. Vet. Med.* **48**: 83-89.
- Oluwasile, B.B., Agbaje, M., Ojo, O.E. and Dipeolu, M.A. 2014. Antibiotic usage pattern in selected poultry farms in ogun state. *Sokoto J. Vet. Sci.* **12**: 45-50.

- Om, C. and McLaws, M.L. 2016. Antibiotics: practice and opinions of Cambodian commercial farmers, animal feed retailers and veterinarians. *Antimicrob. Resist. Infect. Control.* **5**: 42
- Özdemir, D. 2020. The structural characteristics, management, and challenges of backyard poultry farming in residential areas of Turkey. *Animals*, **10**: 2336.
- Pooja, G. M., Asha, R., Devada, K., Priya, M. N., Sajitha, I. S. and Karthika, R., 2021. Occurrence of poultry coccidiosis in different management systems in Thrissur, Kerala. *J. Vet. Anim. Sci.* **52**: 303-307.
- Randall, L.P., Cooles, S.W., Coldham, N.C., Stapleton, K.S., Piddock, L.J. and Woodward, M.J. 2006. Modification of enrofloxacin treatment regimens for poultry experimentally infected with *Salmonella enterica* serovar Typhimurium DT104 to minimize selection of resistance. *Antimicrob. Agents Chemother.* **50**:4030-4037.
- Rawiwet, V., Chansiripornchai, P. and Chansiripornchai, N. 2010. Comparison of efficacy of Enrofloxacin against *Escherichia coli* or *Pasteurella multocida* infections in chickens. *Thai. J. Vet. Med.* **40**:297-301.
- Sainsbury, D. 2000. *Poultry health management*. Malden M A. Black well science Inc, Oxford, UK, pp.204.
- Schneider, K. and Garrett, L. 2009. Non-therapeutic use of antibiotics in animal agriculture, corresponding resistance rates and what can be done about it. Council on Foreign Relations. Center for Global Development: Washington, DC, USA.
- Schulze-Geisthovel, S.V., Tappe, E.V., Schmithausen, R.M., Lepkojts, J., Rottgen, K. and Petersen, B. 2016. Survey on the risk awareness of German pig and cattle farmers in relation to dealing with MRSA and antibiotics. *Infect. Ecol. Epidemiol.* **6**: 29817.
- Sharma, B. 2010. Poultry Production, management and biosecurity measures. *J. Agri. Environ.* **11**: 120-24.
- Sumano, L.H., Ocampo, C.L., Brumbaugh, G.W. and Lizarraga, R.E. 1998. Effectiveness of two fluoroquinolones for the treatment of chronic respiratory disease outbreak in broilers. *Br. Poult. Sci.* **39**:42-46.
- Temmerman, R., Pelligand, L., Schelstraete, W., Antonissen, G., Garmyn, A. and Devreese, M. 2021. Enrofloxacin Dose Optimization for the Treatment of Colibacillosis in Broiler Chickens Using a Drinking Behaviour Pharmacokinetic Model. *Antibiotics.* **10**: 604.
- Wongsuvan, G., Wuthiekanun, V., Hinjoy, S., Day, N. P. and Limmathurotsakul, D. 2018. Antibiotic use in poultry: a survey of eight farms in Thailand. *Bulletin of the World Health Organization.* **96**: 94–100.
- Zwald, A.G., Ruegg, P.L., Keneene, J.B., Warnick, L.D., Wells, S.J., Fossler, C. and Halbert, L.W. 2004. Management Practices and reported antimicrobial usage on conventional and organic dairy farms. *J. Dairy Sci.* **87**: 191-201. ■