

# Antibiotic Usages and Management Practices in Selected Layer Farms of Kamarkhanda Upazila of Sirajganj District

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## ABSTRACT

*Most of the poultry farms in Bangladesh use antibiotics to combat the risk of disease occurrences due to poor managerial practices. This haphazard and illegitimate use of antibiotics is responsible for antibiotic resistance and residual problem in eggs and poultry meat. However, data on antibiotic consumption by layer birds and farmers' perspectives are shockingly rare in Bangladesh. In order to understand farmers' perceptions and antibiotic usage in Bangladesh's small-scale layer farms, this study was performed. The research has been completed through a quantitative approach. A questionnaire survey with 20 small-scale layer farms was performed in Kamarkhanda Upazila of Sirajganj district, Bangladesh. Data has been collected and examined on farmers' educational status, farm management, egg management, antibiotic usage and factors responsible for it. We found that 95% of farmers do not follow the drug withdrawal period though 75% of farmers had some idea about drug residue in meat and egg. 70%-layer farms are involved in antibiotic usage, not only therapeutic but also prophylaxis and egg production enhancement. Eight different types of antibiotics of six classes are randomly used without proper justification that can pose resistance and residual problem. Any of the farmers need to practise cleaning and disinfection of egg trays. It is a sign of poor management. Monitoring of antibiotic use and residue, application of proper biosecurity in farms, application of rules and legislation, and penalization for illegal practices should be implicated in Bangladesh to control antibiotic resistance and residue.*

**KEYWORDS:** Antibiotic Usage, Farmers' Perspective, Layer Farms, Managerial Practices, Bangladesh

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## INTRODUCTION

The egg is classified as a standard protein which readily available and cheap at the same time. (Frenich et al. 2009). At present, there are approximately 1500000 commercial poultry farms in Bangladesh. Among them, 50% are layer farms that produce 7.34 billion eggs annually (Ferdous et al. 2019). These layer birds are exposed to antibiotics commonly for therapeutic purposes, preventive purposes, growth and egg production (Vandenberge et al. 2012; Zhang et al. 2014). Tetracyclines, aminoglycosides, quinolones, beta-lactams, sulfa drugs, amphenicols, macrolides and polypeptides are common antibiotics prescribed in the veterinary sector of Bangladesh that is delivered in poultry rearing through feed and water (Casewell et al. 2003 and Ferdous et al. 2019).

According to the Bangladesh Veterinary Practitioners Ordinance, 1982, prescribing medicine and performing surgery on an animal is only allowed by the registered veterinarian. However, the scenario of veterinary practice is absurd in the country. Here, veterinarians, non-veterinarians and farmers used antibiotics in poultry farms without disease diagnosis or for growth enhancers (Wadoum et al. 2016). Ignoring the Drug Act of 1940, antibiotics are sold in pharmacies with or without a legal prescription. Till now, Bangladesh has no proper guidelines for using antibiotics in layer farms. So, the indiscriminate usage of antibiotics in poultry for treatment purposes and prevention of infectious diseases or growth promoters is widespread (Hasan et al. 2011). On the other hand, a proper withdrawal period is not followed during selling eggs or meat (Ferdous et al. 2019).

However, reckless usage of antibiotics in laying hens eventually leads poultry products to gather antibiotic residue and work as a fundamental force in developing antimicrobial resistance (AMR) in bacteria (Hassan et al. 2014). A little data is available about farmers thinking on antibiotic usage, residue, and AMR in Bangladesh. Again, National sales data are not completed though it can be helpful to estimate Antibiotic usage in the whole country (Ferdous et al. 2019). It is necessary to have accurate information on farmers' perspectives, Antibiotic management, withdrawal period and so on. These types of data are insufficient in Bangladesh. Again, it is necessary to have location-wise data to understand the difference in antibiotic usages pattern and management practices of poultry farms among different Upazilas of Bangladesh. So,

the study was planned to access the farmers' knowledge along with antibiotic prescription patterns targeting small-scale layer farms in Kamarkhanda Upazilla of Sirajganj district. Accurate data can create a pathway to control the haphazard application of Antibiotics in layer farms in Bangladesh.

## **LITERATURE REVIEW**

Antibiotics are drug that is used to treat bacterial infection in the host body. Usually the word antibiotic is used to describe a drug produced from a living organism and works against bacteria. They mainly exert their action by killing or inhibiting bacterial growth. Thus, they cure microbial infection (Waksman 1947). Nowadays, the term antibiotic and antibacterial are used and vice versa by including synthetic compounds such as sulfonamides and quinolones as well. The first discovered Antibiotic was Penicillin(Flemming 1929). The first synthetic antibiotic widely active against Gram-positive bacteria and belonging to the sulfonamide group was Prontosil. With the march of time, different antimicrobials are approved for growth promotion, treatment and disease prevention in food animals that are leading a farm to economic prosperity (Mcbride et al. 2008). There is evidence that veterinary practices use more antibiotics than human medicine, and this practice can act as an essential factor for emerging antibiotic-resistant bacteria (CDC 2013).

Nowadays, the efficient production of poultry has been made possible by using antibiotics as growth promoters in developing countries like Bangladesh. This has allowed consumers to purchase high-quality meat and eggs for a fair price. A study found that 31%, 5% and 66% of farmers used antibiotics for therapeutic, prophylactic and prophylactic curative purposes, respectively, in Cameroon. Twenty-six (26) different types of drugs were used on those farms. They were classified as coccidiostats, anthelmintics, and formulations with low doses of antibiotics used as growth promoters (Wadoum et al. 2016). A survey was conducted with 58 poultry farms. Small-scale poultry farms with populations of 500 to 2000 birds are included among them. All poultry farms utilized one or more antibiotics; 21 (36.2%) used antibiotics for therapeutic purposes, 17 (29.3%) for prophylactic purposes, and 19 (32.8%) for both therapeutic and prophylactic purposes and the remaining 4 (6.9%)

employed antibiotics as growth promoters (Oluwasile et al. 2014). According to another study, more than 4.5 million kg of antimicrobials were used in 2012 for production purposes. 25% of the amount was used in the pre-starter and starter phases, and the rest was used in the grower and finisher stages (Krishnasamy et al.2015).

In a survey of 64 production cycles of 48 poultry farms, it was found that over 32 farms used antimicrobial drugs. In 43 percent of the production cycles that were observed, amoxicillin was the most frequently used antimicrobial agent. Tylosin (30%), trimethoprim sulphamide (18%), lincomycin-spectinomycin (15%), and enrofloxacin (10%) were next in line. Less frequently used drugs included doxycycline (8%), lincomycin (7%), tilmicosin (3%), flumequine (2%) and penicillin (2%) (Persoons et al.2012). A survey of layer farms in Sudan's Khartoum State reported about lacking of knowledge of antimicrobial usages, residue, withdrawal period, and disease control programs among layer farmers and producers (Sirdar et al.2012).

In Bangladesh, a total of 420 poultry farms were surveyed. It was found that 86.04 % of farmers applied antibiotics with water. Most of them were unaware of storage facilities for drugs, withdrawal periods, and residue. Mostly prescribed antibiotics were ciprofloxacin, levofloxacin, enrofloxacin, amoxicillin, tylosin, oxytetracycline, doxycycline, sulfonamides, gentamicin and colistin. There was evidence of finding antibiotic residue in poultry manure (Sarker et al., 2020). The 120 small-scale layer farms in Bangladesh's Mymensingh district were the subject of another study. They claimed that the most and least frequently used drugs on their farm were ciprofloxacin and norfloxacin, respectively (Ferdous et al., 2019).

As the amount of data about the use of antibiotics and the management of layer farms is low in Bangladesh, so it becomes necessary to gather correct information on those issues to prevent AMR and residue in food. Again, no specific survey was conducted on kamarkhanda Upazila of Sirajganj district though it has an excellent future perspective in poultry sections. So, the current study aims to investigate how antibiotics are used and how they are managed in small-scale layer farms in the region mentioned above.

### **Objectives of the Study**

This research was designed to achieve two objectives which are:

- a) To assess the use of antibiotics and its management practices in poultry farms in Kamarkhanda Upazila; and
- b) To identify a better way to address the excessive use of antibiotics in the selected farms.

### **METHODOLOGY**

#### **Research Approach**

A quantitative approach is the best for the data related to the population's opinions and trends (Clark & Creswell. 2008). So, the research was designed according to a quantitative approach.

#### **Study Area**

The selected area of the study was Kamarkhanda Upazila (Administrative region) of Sirajganj district, Bangladesh.

#### **Selection of the Farms**

A total of 20 small-scale layer farms were selected randomly from Kamarkhanda Upazila of Sirajganj district. Small-scale farms have 500-1500 ft shed size (Ferdous et al. 2019).

#### **Preparation of Questionnaire**

To assess AMR and the scenario of residues in a particular Upazila, a well-structured questionnaire regarding management practices of farms and antibiotic consumption patterns was prepared. It was written both in English and Bangla and mainly based on previous research (Ferdous et al. 2019 and Sarker et al. 2020) with proper modification regarding location, targeted population and purpose. The script was discussed with some farmers to increase its reliability and understanding. The researcher modified the questions according to need before finalization.

#### **Collection of Data**

Data were collected through in-person interviews with farm owners in May 2022. They were explained in Bangla, and all the answers were double-checked for proper information. The questionnaire was split into four segments, namely (A) General information about farms and Farmers, (B) Farm management practices, (C) Uses of Antibiotics (D) Egg

management. Interviewees were asked about feed supplements, residual antibiotic knowledge, antibiotic prescription, storage, dose completion, vaccination, name of Antibiotic, frequency of treatment, withdrawal period, an egg try washing and government monitoring. The total no. of layers, age of the bird, and educational status of the farmer were also noted.

### **Ethical Approval and Informed Consent**

This study was not required to have ethical approval. Informed consent was obtained from the survey participant. The researcher described the purpose of the study to the respondents. The researcher was committed to taking care of the confidentiality and safety of participants. They had the freedom to discontinue the interview if they felt embraced

### **Data analysis using Statistical tools**

All of the data was kept in Microsoft Excel 2019. Simple frequency and percentage were used to present the interviewee's responses, and Microsoft Excel was used to prepare the graphs.

## **RESULTS**

All the data are based on the responses from 20 small-scale layer farmers of Kamarkhanda Upazila. The location of the study area is presented in Figure 1. The researcher has excluded some farms due to the farmer's noninterest in participating in the survey and empty poultry sheds during data collection. All the data are collected to keep pace with sustainable development goals (SDGs) and worldwide emerging problems of AMR and antibiotic residue.



*Figure 4.1: Location of Surveyed Layer Farms. The Black Circle Indicates Location of Kamarkhanda Upazila*

#### **Farm's Condition and Farmers' Educational Status**

Data were collected on the farm's condition and the educational status of farmers. As the selected category was small-scale farms, all farms had a single shed with the same aged birds. We found that 25% of females are the owner of farms. Farmers were asked about their education level. We sub-categorized the educational status into illiterate, Primary, Secondary, Higher secondary/Diploma, Graduate and Postgraduate. Most of the farmers had the education of higher secondary level/diploma, and the percentage is 40%. No post-graduate people were involved in small-scale farming during the survey.

On the other hand, 5% of illiterate people were involved in farming. 25% of farmers had primary education, and 20% had secondary school certificates. It is a matter of hope that 10% of graduated people were involved in farming during the interview.

### **Management Practices of Farms and Birds**

Farmers were asked about the management of their businesses. Here in that area, all targeted farmers used commercial feeds. Moreover, they need to find out whether this feed contains antibiotics. Most (90%) of the farmer had good knowledge of the shelf life of a drug. However, almost all farmers (95%) are indifferent to maintaining a withdrawal period during product selling, such as egg and meat. 75% of farmers had the idea of drug residue, but any of them do not care about it during their business. 100% of farmers were aware of the vaccination of birds, and they performed it timely. We have categorized the drug storage facilities into i) store room, ii) poultry shed, iii) refrigerator, and iv) others.

### **Egg Management and Monitoring of Antibiotic Residue**

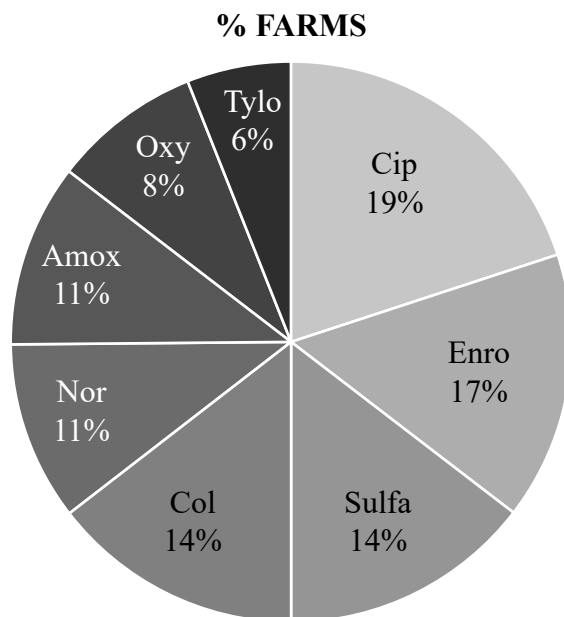
During the survey, the wet cleaning of eggs (Ferdous et al. 2019) was considered. The interviewer also gathered data regarding egg tray Cleaning and Disinfection (C&D). Only one farmer out of 20 (5%) was used to washing eggs before selling. There were no regular C&D of egg trays in those farms. Nevertheless, 50% of farmers practised C&D sometimes with specific time intervals. Furthermore, the rest of the farmers have yet to think about C&D. We asked them about antibiotic residue monitoring on their farms from governmental or non-governmental organizations. There was no monitoring of antibiotic residue in the products.

### **Pattern of Antibiotic Usage and Related Factors**

The interviewer not only asks the farmers about antibiotic usage but also observes the packets of antibiotics during data collection. We found eight different types of Antibiotics were being used in the farms. Most of the farmers were multidrug user. Ciprofloxacin (CIP), Enrofloxacin (Enro), Norfloxacin (Nor), Colistin (Col), Oxytetracycline (Oxy), Sulfa drug, Tylosin (Tylo), Amoxicillin (Amox) were documented that time. The highest used drug was ciprofloxacin (19.45%), followed by enrofloxacin,



sulfa drug, colistin, norfloxacin, amoxicillin, oxytetracycline and tylosin (5.56%). Details of data are presented in Figure 2.



**Figure 4.2:** Percentage of Antibiotic Usage in Selected Layer Farms

Further, we categorized our data in the class of antibiotics. Our data showed that Fluoroquinolones (FQs) were used most (47.33%), then sulfa groups (13.88%) and polymyxin (13.88%), followed by aminopenicillin (11.11%) and tetracycline (8.34%). The lowest-used group was macrolides (5.56%). In some countries, for layer birds, using of FQs, Aminopenicillin, and sulfa groups is not approved by FDA to decrease bacterial resistance (Marmulak et al. 2015). In the case of antibiotic usage, some farmers used it daily with water. Due to unawareness of antibiotics usage, they (40%) also rely on the prescription of non-veterinarian. The non-veterinarian prescription includes self-prescription based on experience, dealers' suggestion, a prescription from quack and other non-registered personnel of the livestock sector. Rest was taking suggestions from registered veterinarians who can be government veterinary surgeons, private practitioners and company-appointed veterinarians. Farmers used antibiotics not only for therapeutic purposes but also prophylaxis and egg production increment. 100 % of farmers did course completion of antibiotics. Feed

and water are popular routes for drug administration in poultry. Data on the purpose of antibiotic usage, Prescription authority, medium of administration of the drug, and frequency of antibiotics used are presented in Table 1.

**Table 4.1:** *Factors Related to Antibiotics Usages*

Determinants	Categories	No. of Farms	Percentage (%)
Where do you store antibiotics?	Storeroom	5	25
	Poultry shed	10	50
	Refrigerator	3	15
	Others	2	10
Who do prescribe the antibiotics?	Non-Veterinarian	8	40
	Veterinarian	12	60
Why do you use antibiotics?	Only Therapeutic	6	30
	Therapeutic and prophylaxis	9	45
	Therapeutic and egg production increasement	5	25
Which medium do you prefer for antibiotic administration?	Feed and water	5	25
	Water	15	75
How many days do you use Antibiotics?	Daily	2	10
	When needed	18	90

## DISCUSSION

In this study, we tried to figure out the farmers' perspective of the small-scale layer farm of KamarkhadaUpazila in Bangladesh. We exclude those farms whose owners are unwilling to cooperate. Though we found that most of the farmers are educated, they are indifferent to maintaining the withdrawal period. Again, around 75% of farmers know about antibiotic residue, but this knowledge did not push them to follow the withdrawal period. According to the opinion of some farmers, suggestions for residue and possible solutions are rare from a veterinarian. Some farmers found that authority is non-cooperative and not easily accessible (Roess et al. 2013). It is evident that the veterinarian has knowledge of antibiotic residue and the withdrawal period. Due to socioeconomic factors, they need to create awareness among mass farmers. The socioeconomic factors could be no government insurance policy, a planned business chain from producer to consumer, and a risk assessment policy (Ferdous et al. 2019). Moreover, the whole scenario

indicates the transfer of drug residue from the egg to the human body. This can be a potential risk of the emergence of superbugs (Wadoum et al. 2016).

A total of 100% of farmers of survey farms are aware of vaccination. Nevertheless, any of them are not cleaning the egg, try regularly. This is a sign of poor management. Only vaccination can save poultry farms from disease. Good managemental practices, e.g., biosecurity, farm hygiene, drug management, and pest control, are also necessary (Sirdar et al., 2012). For these reasons, vaccination did not fully support combatting diseases. A good combination of management and vaccination can drive a farm toward success. Again, sometimes vaccination schedules do not fit with the local pattern of disease and existing facilities of farms (Marangon et al. 2006). So, they rely on antibiotics to keep the farm free from infectious diseases. For that, we found the involvement of 100% of farms in antibiotic usage. This finding is comparable with another study (Oluwasile et al. 2014; Nonga et al. 2009; Sirdar et al. 2012 Marangon et al. 2006). It is a good sign that all farmers know the course completion of the drug, and 90% of farmers care about the drug's shelf-life. Antibiotics were being used for different purposes, including therapeutics, in these farms. But it is a matter of agony that 10% of farmers use antibiotics daily without an acceptable explanation. This is one of the factors related to AMR and antibiotic residue in poultry products (Sarker et al., 2020).

About 40% of farmers were involved in non-veterinarian prescriptions, which is an unlawful practice. Self-prescription is also seen. One possible cause of this can be the unavailability of registered veterinarians, ignorance, and improper training (Mubito et al. 2014 and Roess et al. 2013). Some dishonest practitioner also prescribes poor-quality of medicine. Sometimes farmers also buy poor-quality drugs from pharmacies due to persuasive marketing policy. These substandard antibiotics cannot kill bacteria. These all contribute to the indiscriminate use of antibiotics that led to AMR and the lingering issue (Clifford et al. 2018). It indicates that Bangladesh lacks awareness of food security and safety, public and environmental health and lawful activities.

In our survey, we found that using of FQs was highest in KamarkhandaUpazila. Ciprofloxacin was the top used Antibiotic, whereasTylosin was the lowest in use. The administration of multidrug is common in those farms. This finding has excellent relevancy with other research (Ferdous et al. 2019; Wadoum et al. 2016; Nonga et al. 2009;

Amaechi et al. 2014). Though salmonellosis, colibacillosis, fowl cholera, and mycoplasmosis are the highest prevailed diseases in the poultry industry in Bangladesh, the use of antibiotics does not match with disease pattern (Giasuddin et al. 2002). It reveals that most antibiotics are used without proper justification and diagnosis. For this, prescribers and users rely on broad-spectrum antibiotics. Antibiotics are in powder form, and farmers use water as a medium for antibiotic delivery. Some were also using feed along with water. Water causes even distribution of a drug that gives the best performance (Sirdar et al. 2012). Therefore, all the phenomena are responsible for emerging Multi-Drug Resistance Bacteria and residual problems in Poultry products.

Our questionnaire survey does not cover the whole Kamarkhanda Upazila due to time limitations. It gives a glimpse of antibiotic use in small-scale layer farms, and more data are necessary to summarize antibiotic usage in Bangladesh. This type of research can help develop food safety programs and public health issues and ensure animal welfare.

### **CONCLUSION AND RECOMMENDATION**

The data regarding antibiotics usage and related factors are dormant in Bangladesh, and sales data are also insufficient to assume the correct amount of antibiotics usage. Unawareness of the withdrawal period and antibiotic residue, use of non-FDA-approved antibiotics without proper diagnosis, using antibiotics as a tool of disease control, and prescription practice by non-veterinarians without justification are significant findings of the study. Besides, buying low-grade medicines and no maintenance of cleaning and disinfection in farms increase the risk of antibiotic resistance among biota and hamper poultry-originated food security. Though our current research reflects one Upazila of Sirajganj district, it can still play a significant role in building responsible antibiotic usage policies throughout the country. A complete survey throughout the country and an accumulation of all sales data are needed to summarize the situation of antibiotics consumption by poultry in the country. Strict biosecurity, training of farmers, awareness program, controlling of quacks, laws and legislation against illegal pharmacies and companies, residue monitoring in poultry products, and development of national guidelines for antibiotics usage are highly recommended to ensure the best utilization of antibiotics. Only the combined efforts of government and general folks can control the rampant application of antibiotics in layer farms to ensure responsible

consumption and production of animal proteins and good health and well-being.

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### **CONFLICT OF INTEREST**

There is no conflict of interest.

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