Survey on Antibiotics Practices According to WHO Guidelines in Cox's Bazar District, Chattogram

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Abbreviations	Elaboration
AWaRe	Access, Watch and Reserve
WHO	World Health Organization
AMR	Antimicrobial Resistance
OTC	Oxy-tetracycline
PPR	Peste des petits ruminants

ABSTRACT

Improper antibiotic usage in the livestock sector represents a significant concern for food safety and contributes to the emergence of antimicrobial-resistant bacteria. A cross-sectional study was carried out to evaluate the use of antimicrobials and understand the perspectives in cattle and goat farmers in the Cox's Bazar district of Chattogram, Bangladesh. The data was collected from 40 cattle and goat farms in the region through a meticulously designed questionnaire. The findings of the study reveal that the most commonly used antibiotics in this area include ceftriaxone, streptomycin-penicillin, OTC which are mostly 'Watch' group of antibiotics according to AWaRe category of WHO leading to 71.43%. Interestingly, many participants reported that their prescribers were often unaware of the appropriate drug withdrawal period, leading to 90% of the farmers not adhering to it. Furthermore, the farmers showed a lack of awareness regarding the implications of antimicrobial resistance on animal health. Only 45% and 35% of the farmers consistently followed the guidance of a veterinarian and completed the full course of prescription respectively. The study also identified the educational and experience background of the farmers contribute to their ignorance toward antibiotic resistance. In response to the challenge of antibiotic resistance, the study emphasizes the importance of farmer awareness initiatives and antimicrobial stewardship programs that target veterinarians and other stakeholders. These initiatives are vital in promoting responsible antimicrobial use and addressing the issue of antibiotic resistance.

Keywords: Antibiotic resistance, Withdrawal period, AWaRe.

CHAPTER 1

INTRODUCTION

Antibiotics serve three primary purposes in the context of farm animals: they are used to treat sick animals and to promote growth by enhancing feed efficiency (Sawant *et al*., 2005; Ventola, 2015). Unfortunately, the improper, unnecessary, and excessive use of antibiotics in food animals has led to the accumulation of drug residues in animal-derived products and the emergence of antimicrobial-resistant bacteria (Salehzadeh*et al*., 2006; Stolker and Brinkman, 2005). This unregulated antibiotic use significantly contributes to the development and spread of antibiotic-resistant microorganisms in both humans and animals, particularly among livestock farmers in many developing countries.

Various classes of antibiotics have been approved for animal use, including third and fourth-generation cephalosporins, fluoroquinolones, and macrolides (Sarmah *et al*., 2006). Unfortunately, many veterinarians often prescribe these antimicrobials in routine cases, prioritizing quick results without fully considering the risks of resistance development (Sarker *et al*., 2016). Consequently, it's crucial for veterinarians to recognize the importance of reserving stronger antimicrobials as essential tools to address the growing threat of resistance.

In developing countries like Bangladesh, the choice of antibiotics is primarily based on personal experience and perception (68%) rather than conducting cultural sensitivity tests (Akter *et al*., 2012). This reliance on personal judgment is likely due to the lack of local veterinary diagnostic facilities and some level of hesitation. Another vital aspect in the fight against antibiotic resistance is raising awareness among farmers (Friedman *et al*., 2007).

In 2017, the WHO Expert Committee on Selection and Use of Essential Medicines introduced the AWaRe Classification of Antibiotics as a valuable tool to promote responsible antibiotic use on a global scale. This classification system divides antibiotics into three main groups: Access, Watch, and Reserve. The purpose of this classification is to underscore the importance of using antibiotics appropriately while considering their impact on antimicrobial resistance. In the 2021 update of the AWaRe classification, a total of 258 antibiotics are included, marking a significant increase from the previous 78 antibiotics that were not categorized.

Indeed, the AWaRe classification serves as a valuable tool for monitoring antibiotic usage, establishing objectives, and evaluating the effectiveness of stewardship policies aimed at optimizing antibiotic utilization and mitigating antimicrobial resistance. As part of the WHO's 13th General Programme of Work for 2019–2023, a significant goal at the country level is to ensure that Access group antibiotics make up at least 60% of all antibiotic usage.

The 'Antimicrobial Resistance Global Report on Surveillance' by the World Health Organization (WHO) has identified elevated resistance rates in bacterial pathogens commonly associated with hospital, community, and food chain diseases in areas with lower levels of education (WHO, 2014). While veterinarians are typically responsible for selecting appropriate antimicrobials for treatments, farmers' preferences and demands can be influenced by factors like cost, profit potential, ease of medicine administration, and withdrawal periods (Van der Fels-Klerx *et al*., 2011).

Globally, the most commonly used antimicrobials, including B-lactams, tetracyclines, aminoglycosides, quinolones, macrolides, and sulfonamides, are frequently employed to prevent infections and enhance the growth of farm animals (Brogden *et al*., 2003) The primary concern revolves around the potential for antimicrobial-resistant (AMR) bacteria to transfer from animals to humans, often through contact, water, manure, or contaminated dairy products (CAC, 1998). The unauthorized use of antimicrobials can lead to the presence of their residues in milk and animal tissues (Ivona and Mate, 2002).

Regrettably, these practices are not followed in Bangladesh. Veterinarians and livestock professionals in the country typically fail to adequately advise farmers on adhering to the necessary withdrawal periods for food-producing animals. Consequently, farmers lack awareness of the persistence of drug residues in milk and milk products, which can have a detrimental impact on human health and contribute to the development of drug-resistant pathogens (Apata, 2009).
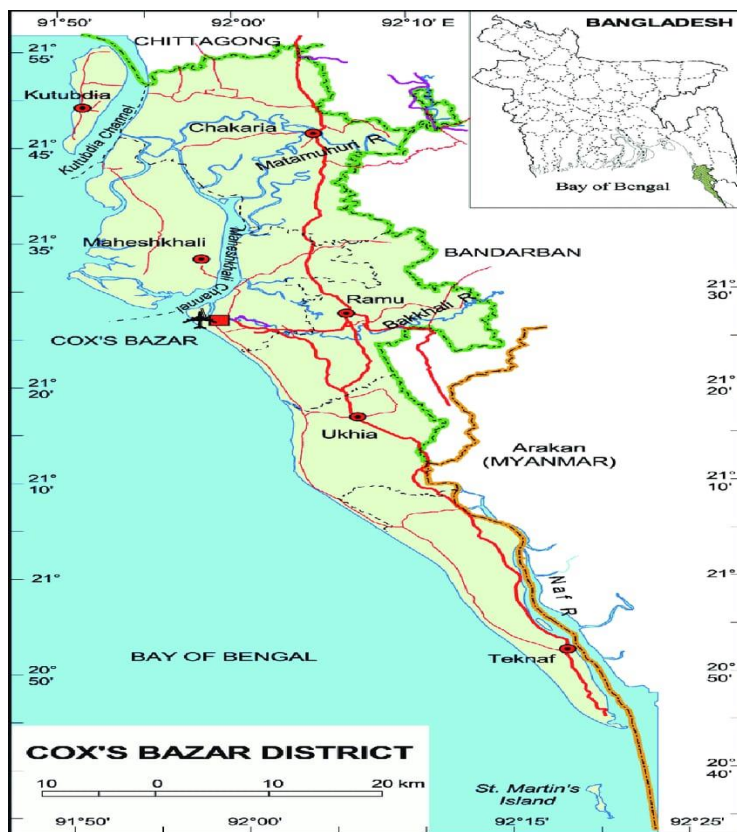
So, the objectives of this study is as follows:-

1. To identify which antibiotic group are used commonly in cattle and goat in Cox's Bazar, Chattogram.
2. To identify which category of antibiotics is used according to AWaRe group suggested by WHO.

CHAPTER 2

MATERIALS AND METHODS

2.1 Study area

The study was centered around the Coxs Bazar district in the Chattogram division.This region has witnessed the growth of commercial dairy farming due to the high demand for milk and dairy products, and it boasts a significant market for these agricultural products.

Fig1: Geographical locations of the selected farms

2.2Data collection

The research took place between May 2023 and June 2023, involving data collection utilized both interviews and record sheets of approximately 40 cattle and goat farms. To collect data, a well-structured questionnaire was meticulously developed in advance. The questionnaire used in the interviews covered various aspects, including the farmers' level of education, the most frequently used antimicrobials, their knowledge about antibiotics and antibiotic resistance, antibiotic residue management, practices related to antimicrobial use within the withdrawal period and how drugs were stored and disposed.

2.3 Data tabulation and analysis

The farmer's responses were documented on the questionnaire. Following this, the collected data was systematically arranged and presented in tabular form, with numerical figures represented as percentages

Questionnaire

Antibiotic Use in Cattle Goat Farms in Cox's Bazar According to AWaRe group

Name of the farm :

Owner name :

Address :

Experience and Qualification :

Farm details

   1) Total cattle   :

   2) Total goat   :

   3) Do you have foot bath in your farm?

   a) Yes   b) No

Antibiotic Usage information

   4) Do you use antibiotics in your farms?

   a) Yes   b) No

If yes, please specify the reason

   a) Disease treatment   b) Growth promotion

Name of the antibiotics   :

   c) Do you take advice from the veterinarian in nearby UVH?

   a) Yes   b) No

   d) Do you maintain the dosage according to the prescription?

   a) Yes   b) No

   e) Do you properly store and dispose the antibiotic bottles?

   a) Yes   b) No

   f) Do you know about antibiotic resistance and maintain withdrawal period?

   a) Yes   b) No

CHAPTER 3

RESULTS AND DISCUSSION

3.1 Basic details about the farm

3.1.1 *Farm type*

Farms that were visited was categorized into 3 groups. They are A type (more than 50 livestock), B type (31-50 livestock) and C type (less than 30 livestock). Amongst 40 farms 17.5% were A type, 25% were B type and 57.5% were C type farms.

3.1.2 *Experience*

The breakdown of owner experience is as follows: 37.5% have 0-5 years of experience, 25% have 5-10 years of experience, 17.5% have more than 10 years of experience, and finally, 20% of them possess over 20 years of experience. This distribution illustrates a blend of both newcomers and seasoned individuals within the field.

Table 1: Basic details about the farm

Parameters	Categories	Number	Percentage (%)
Farm type	A (>50 livestock)	7	17.5%
	B (31-50 livestock)	10	25%
	C (<30 livestock)	23	57.5%
Experience	0-5 years	15	37.5%
	5-10 years	10	25%
	10 years+	7	17.5%
	20 years+	8	20%
Foot bath	Yes	10	25%
	No	30	75%
Record keeping facilities	Yes	12	30%
	No	28	70%

3.1.3 *Footbath*

When assessing the adoption of Footbath practices, it is apparent that a minority of participants (25%) have implemented this hygiene measure, while the majority (75%) have opted not to do so. This suggests that a significant portion of the participants has yet to embrace this particular method.

3.1.4 *Record keeping facilities*

In terms of record keeping facilities, it is clear that a minority of participants (30%) have implemented this measure, while the majority (70%) have opted not to. This highlights that a significant portion of the participants is not yet aware of the benefits of this particular activity.

3.2 Antibiotics using template in farms

The table indicates ceftriaxone is the most (32.5%) used antibiotics in the area. Whereas Streptomycin-Penicillin having 22.5% was the second priority of the farmers. Ciprofloxacin was the least (2.5%) type of antibiotics that are administered. In Midenge's (2010) research, 187 small-scale dairy cattle farmers in Kinondoni Municipality were surveyed about their antibiotic usage. The study revealed that the most commonly used antibiotics were tetracycline (utilized by 79.5% of farmers), penicillin-streptomycin (employed by 55%), sulfadimidine (used by 18%), gentamycin (used by 10%), and kanamycin (used by 8%).

Table 2: Different antibiotics used in farms

Antibiotics	Number of farms	Percentage (%)	WHO category
Amoxicillin	2	5%	Access
Streptomycin-Penicillin	9	22.5%	Watch
Ciprofloxacin	1	2.5%	Watch
Oxy-tetracycline	5	12.5%	Watch
Ceftriaxone	13	32.5%	Watch
Penicillin G	4	10%	Watch
Sulfadimidine	6	15%	Access

In a cross-sectional survey conducted in Bangladesh's Naogaon district (Sarker *et al.*, 2016), sulfa drugs (34%), aminoglycosides (29%), oxy-tetracycline (13%), a combination of aminoglycoside and β-lactamase (12.44%), and β-lactamase (12.44%) were reported as the most commonly used antibiotics in goats, with a 10% utilization rate.

However, it's important to note that these findings differ from the current study's results, as Sarker *et al.* (2016) conducted their research in an area with a higher prevalence of PPR, while myiasis is more common in Chittagong. Another study conducted at Usmanu Danfodiyo University Veterinary Teaching Hospital (UDUVTH) in Sokoto found that oxy-tetracycline was the most frequently used antibiotic (37.6%), followed by penicillin (24%) and aminoglycosides (17.6%) (Agaie*et al*., 2016). This variation could be attributed to differences in geographical location, the broad-spectrum nature of oxy-tetracycline, its availability, and its wide range of applications. In the current study, streptomycin-penicillin was the most recommended antibiotic. This choice was influenced by its ability to treat both gram-positive and gram-negative bacteria, its widespread availability in local markets, and its lower cost compared to other antibiotics.

3.3 Antibiotics according to WHO category

In the following pie chart it is evident that in Cox's Bazar district, antibiotics that are used or prescribed are mostly Watch group of antibiotics bearing 71.43% and minor percentage (28.57%) are Access group of antibiotics.

AWARE CATEGORY

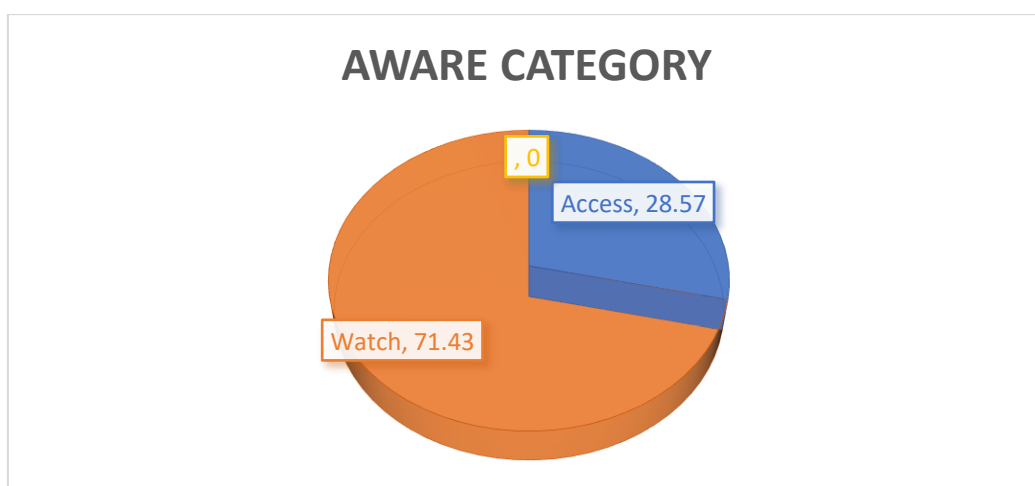, 0
Access, 28.57
Watch, 71.43

Chart 1:- AWaRe category of WHO

Antibiotics with an elevated potential for resistance encompass a significant portion of the highest priority agents among the Critically Important Antimicrobials for Human Medicine. These antibiotics are also considered to be at a relatively high risk of promoting the selection of bacterial resistance. Lack of awareness and knowledge about the drastic effects of antibiotic resistance, ignorance and less access to vets could attribute to this result.

3.4 Farmer perception regarding antibiotics

3.4.1 *Know about antibiotics*

The bar diagram below illustrates that 92.5% of farmers are familiar with the term "antibiotics" and their applications, while the remaining 7.5% are not well-versed in the uses of antibiotics. This suggests a growing awareness among farmers regarding the uses of antibiotics.

3.4.2 *Antibiotic resistance knowledge*

While there is a positive trend in the increasing awareness of the term "antibiotics" among farmers, it's noteworthy that the majority of these farmers (95%) still lack knowledge about antibiotic resistance and its impact on both livestock and human health. In contrast, a study conducted in New Zealand reported that a substantial percentage of farmers (79%) were aware of the potential for antimicrobial resistance (McDougall *et al*., 2017). These findings highlight a significant difference between their results and the current study's findings.
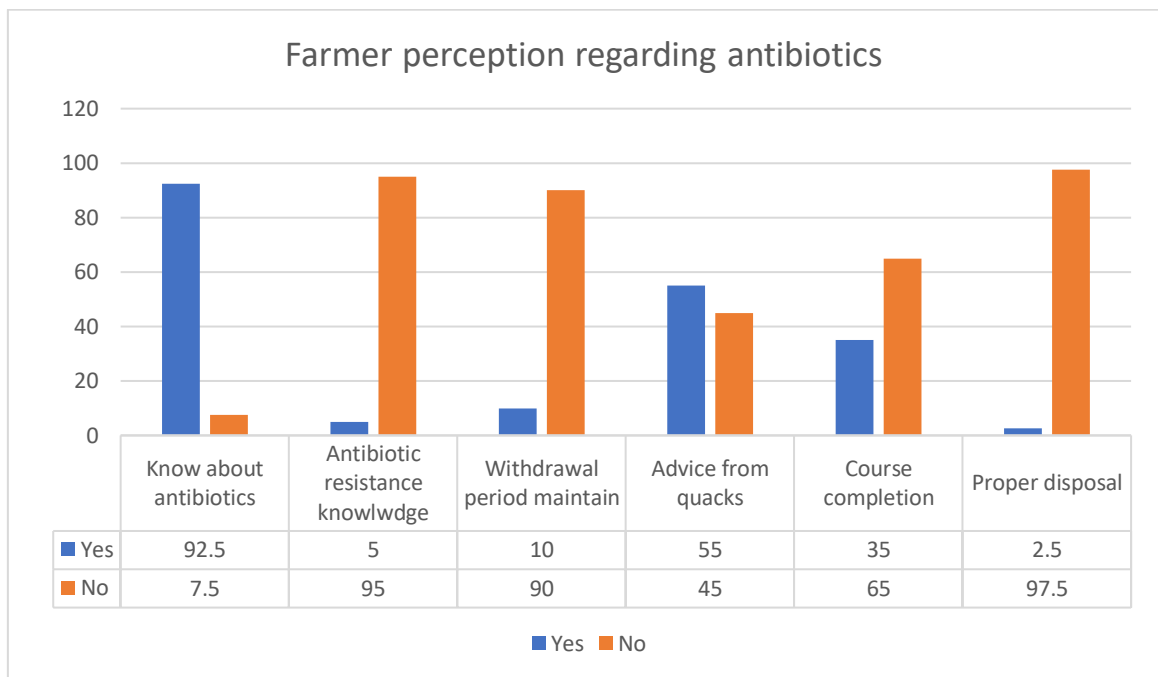
Farmer perception regarding antibiotics

	Know about antibiotics	Antibiotic resistance knowlwdge	Withdrawal period maintain	Advice from quacks	Course completion	Proper disposal
Yes	92.5	5	10	55	35	2.5
No	7.5	95	90	45	65	97.5

Fig 2: Farmers perception regarding antibiotics

Fig 3: Data collection from different farms

3.4.3 *Withdrawal period maintain*

In line with the preceding category, a substantial percentage (90%) of farmers lack awareness regarding the withdrawal period for antibiotics in milk and meat. This knowledge gap can be ascribed to the absence of training on these matters, and it is the root cause of this difference in understanding.

3.4.4 *Advice from quacks*

One of the crucial factors influencing antimicrobial use is a veterinarian's personal experience, as indicated by McDougall *et al*. (2017). Veterinarians, due to their expertise, are better equipped to make informed decisions about the appropriate antibiotics for specific conditions. However, our study differs in this aspect, as 55% of the farmers seek advice from individuals with less knowledge than veterinarians, known as "quacks," regarding medication. This difference in approach is noteworthy. Nevertheless, it's a positive development that an increasing number of farmers are turning to mobile veterinary clinics for assistance, and this number is steadily growing. This trend suggests a shift towards more reliable and professional sources for guidance on antimicrobial use.

3.4.5 *Course completion*

This study reveals that a significant portion of the farmers, specifically 65%, do not finish the full course of antibiotics. This practice is a critical factor contributing to the development of antibiotic resistance in animals.

3.4.6 *Proper disposal*

A substantial majority of farmers, specifically 97.5%, do not typically dispose of empty antibiotic bottles. Consequently, antibiotic residues accumulate in the soil and can subsequently find their way into crops. This practice plays a significant role in the increasing resistance to antibiotics.

CONCLUSION

The study outlines the general pattern of antibiotic usage and its accordance with the WHO guidelines. Among cattle and goats, the most frequently used antibiotic is ceftriaxone and streptomycin-penicillin. However, a significant portion of farmers does not adhere to the prescriptions provided by veterinarians. Additionally, the study reveals that farmers generally lack awareness about antibiotic resistance and withdrawal periods. Many livestock caretakers are also unaware of the effects of antimicrobials on animal health and how antibiotic use can potentially harm both animals and human health. Moreover, the prescribed or medicated antibiotics are mostly Watch group of antibiotics, which are more likely to grow resistance. This study offers insights into farmers' attitudes toward the use of antimicrobials and the issue of antimicrobial resistance .To address these challenges, it is recommended that farmers receive proper training, and veterinarians adopt a friendly approach when prescribing antibiotics. Furthermore, the study suggests that reasonable antibiotic prescribing, following established guidelines, and the adoption of specific treatment plans can lead to a positive change in the current scenario.

REFERENCES

Agaie, B., Daneji, A., Chafe, U., Garba, H., & Ismaila, M. (2016). Drug use and prescription pattern at the UsmanuDanfodiyo University Veterinary Teaching Hospital (UDUVTH), Sokoto; A ten-year retrospective study (2006-2015). African Journal of Pharmacy and Pharmacology, 10, 978-983.

Akter, S. F. U., Rani, A., Fauzi, M., Rathor, M. Y., Aris, M., Aznan, M., Jabbar, M., & Mazumder, S. K. (2012). Hospital physicians' drugs prescription adherence to the essential drugs list of Bangladesh. International Journal of Applied Science and Technology, 2, 71-75.

Bauchner, H., Pelton, S. I., & Klein, J. O. (1999). Parents, physicians, and antibiotic use. Pediatrics, 103, 395-401.

Barua, S., Alam, M. J., Rahman, M. M., Farid, M. S., &Koiry, S. (2018). Selected factors associated with dairy farms' profitability of Chittagong District in Bangladesh. Asian Research Journal of Arts & Social Sciences, 7(1), 1–12.

Bhowmik, P., Ahaduzzaman, M., & Hasan, R. B. (2018). A cross-sectional anthropo-clinical study on antimicrobials prescription pattern in goat patients at Chittagong, Bangladesh. Bangladesh Journal of Veterinary Medicine.

Dernburg, A., Fabre, J., Philippe, S., Sulpice, P., &Calavas, D. (2007). A study of the knowledge, attitudes, and behaviors of French dairy farmers toward the farm register. Journal of Dairy Science, 90, 1767-1774.

Friedman, D., Kanwat, C., Headrick, M., Patterson, N., Neely, J., & Smith, L. (2007). Importance of prudent antibiotic use on dairy farms in South Carolina: a pilot project on farmers' knowledge, attitudes, and practices. Zoonoses and Public Health, 54, 366-375.

Landers, T. F., Cohen, B., Wittum, T. F., & Larson, E. L. (2012). A review of antibiotic use in food animals: Perspective, policy, and potential. Public Health Reports, 127(1), 4–22.

Lalan, B. K., Hiray, R., &Ghongane, B. (2012). Drug prescription pattern of outpatients in a tertiary care teaching hospital in Maharashtra. International Journal of Pharmacy and Biological Sciences, 3, 225-229.

McDougall, S., Compton, C., & Botha, N. (2017). Factors influencing antimicrobial prescribing by veterinarians and usage by dairy farmers in New Zealand. New Zealand Veterinary Journal, 65, 84-92.

Regula, G., Torriani, K., Gassner, B., Stucki, F., &Müntener, CR. (2009). Prescription patterns of antimicrobials in veterinary practices in Switzerland. Journal of Antimicrobial Chemotherapy, 63, 805-811.

Sawant, A. A., Sordillo, L. M., &Jayarao, B. M. (2005). A survey on antibiotic usage in dairy herds in Pennsylvania. Journal of Dairy Science, 88(8), 2991–2999.

Salehzadeh, F., Madani, R., Salehzadeh, A., Rokni, N., &Golchinefar, F. (2006). Oxy-tetracycline residue in chicken tissues from Tehran slaughterhouses in Iran. Pakistan Journal of Nutrition, 5(4), 377–381.

Stolker, A. A. M., & Brinkman, U. A. T. (2005). Analytical strategies for residue analysis of veterinary drugs and growth-promoting agents in food-producing animals. A review. Journal of Chromatography A, 1067(1–2), 15–53.

Sarmah, A. K., Meyer, M. T., & Boxall, A. B. (2006). A global perspective on the use, sales, exposure pathways, occurrence, fate, and effects of veterinary antibiotics (VAs) in the environment. Chemosphere, 65, 725-759.

Speksnijder, D., Jaarsma, A., Gugten, A., Verheij, T., & Wagenaar, J. (2015). Determinants associated with veterinary antimicrobial prescribing in farm animals in the Netherlands: a qualitative study. Zoonoses and Public Health, 62, 39-51.

Sarker, M., Ahaduzzaman, M., Ghosh, S., & Bary, M. (2016). Cross-Sectional Survey on Prescribing Patterns for Food Animal Medications in Bangladesh. Journal of Dairy Science, Veterinary and Animal Research, 3, 00089.

Ventola, C. L. (2015). The antibiotic resistance crisis: Causes and threats. P and T J., 40(4), 277–283.

Vaarst, M., Paarup-Laursen, B., Houe, H., Fossing, C., & Andersen, H. (2002). Farmers' choice of medical treatment of mastitis in Danish dairy herds based on qualitative research interviews. Journal of Dairy Science, 85, 992-1001.

Van der Fels-Klerx, H., Puister-Jansen, L., Van Asselt, E., & Burgers, S. (2011). Farm factors associated with the use of antibiotics in pig production. Journal of Animal Science, 89, 1922-1929

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BIOGRAPHY

I am Md. Shayed Alam, the child of Mrs. Fatema Alam and Mr. Shamsul Alam. In 2014, I successfully completed my Secondary School Certificate examination with a perfect G.P.A of 5.00. Following that, I passed the Higher Secondary Certificate examination in 2016 with a G.P.A of 4.58. Currently, I am working as an intern veterinarian in the Faculty of Veterinary Medicine at Chattogram Veterinary and Animal Sciences University. In the future, I have a strong desire to pursue research in the fields of clinical animal diseases and cell biology within Bangladesh