



Evaluation of Antibiotic Use and Strategies for Mitigating Unethical Veterinary Drugs Prescription in Jere Local Government Area and Maiduguri Metropolis, Borno State, Nigeria

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Abstract

Antimicrobial misuse in the treatment of diseases of microbial origin in veterinary clinical practice is a growing concern due to its contribution to antibiotic resistance. The aim of this research is to gain information on antimicrobial use/misuse through questionnaire-based survey. A total of 100 structured questionnaires was issued to field veterinarians and veterinary shop owners in Jere and Maiduguri Metropolitan Councils of Borno State. This is to help proffer some strategies for reducing unnecessary antibiotic prescriptions, promote diagnostic testing, responsible use and public awareness. These approaches targeted parameters such as client demands, diagnostic uncertainties, clinical inertia, prescriber factors and system level factors. Results from 58 duly filled and returned questionnaires from this study showed that clinical inertia 17 (29.31%) forms the highest reason for antibiotic overuse, followed by system level factors 13 (22.41%), prescriber factor 12 (20.68%), clinical demand 9 (15.51%) and diagnostic uncertainties 7 (12.06%). It was equally observed that antibiotics mostly overused are; Oxytetracycline (50 mg and 200 mg), Penicillin - Streptomycin, Tylosin, Terramycin in this order, and other broad-spectrum antibiotics. This result showed the tendency to use antibiotics with or without disease conditions in animals, and without recourse to cause of disease, form the underlying basis of antibiotic resistance development. Thus, there is a need to curtail antimicrobial resistance through a multi-faceted awareness approach that includes antimicrobial stewardship education programs for veterinarians, para-veterinarians, pet owners, farmers, and the promotion of rational antibiotic use. Government and stakeholders in the livestock sector should work together to implement these strategies for better antibiotic stewardship.

Keywords: Antimicrobials, Misuse, Antimicrobial resistance, Antibiotic prescription, Veterinary medicine.

Introduction

Antibiotics are powerful medications that have revolutionized the field of medicine by effectively treating bacterial infections (Spellberg, *et al.*, 2014). However, the overuse of antibiotics has led to the emergence of antibiotic resistance, a global health crisis that threatens our ability to effectively combat bacterial infections (Estany-Gestal *et al.*, 2024). One of the primary causes of antibiotic resistance is the unnecessary prescription and administration of antibiotics, both parenterally and in animal feed (Livorsi *et al.*, 2015). Studies have shown that a significant portion of antibiotic prescriptions are inappropriate (Livorsi *et al.*, 2015; Fleming-Dutra *et al.* 2016), with many being prescribed for conditions that do not require antibiotic treatment, such as viral infections like common cold or flu. This overuse and misuse of antibiotics contribute to the development of antibiotic-resistant bacteria, making infections difficult to treat and increasing the risk of serious complications (Harvey *et al.*, 2023; Livorsi *et al.*, 2015).

The misuse of antibiotics has led to the emergence of multidrug-resistant microorganisms, which in turn has increased morbidity rates, resulted in ineffective or failed treatment outcomes, and escalated healthcare costs (Llor and Bjerrum, 2014).

Reducing unnecessary antibiotic prescriptions is crucial in combating antibiotic resistance and preserving the effectiveness of these life-saving medications. In recent years, there has been a growing recognition of the importance of implementing strategies to promote judicious antibiotic use and reduce unnecessary prescriptions (CDC, 2019). These strategies encompass a range of approaches aimed at improving antibiotic prescribing practices among healthcare providers, educating patients about the appropriate use of antibiotics, and implementing policies to regulate antibiotic prescription (ASM, 2023).

In response to the growing threat of antibiotic resistance, efforts have been made in some

countries to reduce antibiotic use in food animals, promote judicious antibiotic use generally and reduce unnecessary prescriptions (Bjorkman *et al.*, 2021).

This research was initiated to investigate the primary reasons for the unnecessary prescription of antibiotics in animals and to recommend appropriate strategies towards curtailing this danger. The goal is to proffer solutions for combating antibiotic resistance in animals.

Materials and methods

A structured questionnaire approach was developed for conducting this research on strategies to enable assessment of unnecessary antibiotic prescription and administration in animals within the study area. It outlined key components of the research design, data collection methods, analysis techniques, ethical considerations, and limitations of the study.

The study area

The study areas of interest were Jere and Maiduguri cities. Jere Local Government Area (LGA) with its headquarters at Khaddamari, is situated between latitudes 11° 40' and 12° 05' N, and longitudes 13° 50' and 12° 20' E, covering a total land area of 169,000 square kilometers. Maiduguri Metropolitan Council (MMC) is the capital of Borno state, and is the largest city in the state.

Research Design

The research utilized a qualitative research design by using convenience sampling methods through the administration of 100 structured questionnaires, and conducting a semi-structured interviews to a select veterinary healthcare providers (veterinarians, para-veterinarians and livestock attendants) who have prescribed antibiotics. Veterinary shop owners were also interviewed. The study was conducted in veterinary centers or veterinary drug shops facility where antibiotic prescribing decisions are made. Data were collected from veterinary healthcare pro-

viders who have experience with antibiotic prescriptions.

Data from 58 (58%) returned questionnaires were analyzed using thematic analysis method to determine the frequency of antibiotic use in the two Local Government Councils under study. However, this study was limited by the small sample size and potential biases associated with convenience sampling. Findings from this study were limited to the specific study setting and participants involved.

Results

Based on the analysis of responses from 58 questionnaires sampled, the following results were obtained for factors influencing decision-making in clinical practice and presented (Table 1.0; Fig. 1). Client demands: It was observed that 15.51% (9) of respondents indicated that client demands significantly impact their decision-making process of prescribing antibiotic either for fattening program or prophylactic purposes. Diagnostic uncertainties: It was observed that 12.06% (7) of respondents reported that diagnostic uncertainties play a role in their decision-making because of their lack of confidence to differentiate between viral and bacterial diseases. Clinical inertia: It was observed that a majority of respondents, 29.31% (17), identified clinical inertia as a significant factor influencing their decision-making due to restrictions by guidelines or lack of knowledge of current guidelines of antibiotic use. Prescriber factors: It was observed that 20.68% (12) of respondents acknowledged that prescriber-related factors influence their decision-making process due to lack of proper knowledge of the right antibiotic for the therapeutic effect. System-level factors: It was observed that 22.41% (13) of respondents stated that system-level factors have an impact on their decision-making in clinical practice due to lack of availability of right drug to prescribe. Some drugs that are frequently prescribed in the study area which is Jere and Maiduguri Metropolitan Local Government Area include Oxytetracycline 50 mg (11) and 200 mg (19), Penicillin-Streptomycin (10), Terramycin (6), Tylosin (6) and other broad-spectrum antibiotics (6). (Table 2.0 and Fig. 2). The group/species of animal with the highest number of occurrences is the large animal (77.58%), followed by small animals (15.51%) while avian species (6.81%) recorded the least occurrence (Table 3; Fig.3).

Table 1.0: Frequency of factors influencing decision-making in terms of antibiotic prescriptions

S/N	Factors	Number of respondents	Percentage (%)
1.	Client demand	9	15.51
2.	Diagnostic uncertainties	7	12.06
3.	Clinical inertia	17	29.31
4.	Prescriber factors	12	20.68
5.	System level factors	13	22.41
	Total	58	99.97

Fig 1: Frequency of factors influencing decision-making in terms of antibiotic use.

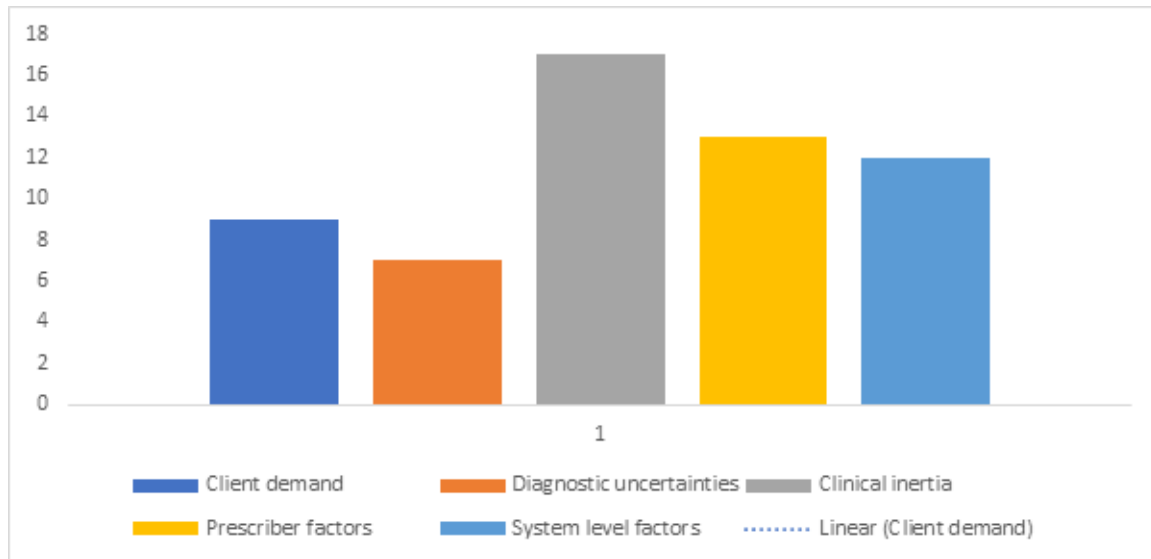


Table 2.0: Response to questionnaire survey on the most prescribed antibiotics

S/N	Antibiotics	Number of Respondents	Percentage of respondents
1	Oxytetracycline 200 mg	19	32.75
2	Oxytetracycline 50 mg	11	18.96
3	Penicillin-Streptomycin	10	17.24
4	Tylosin	6	10.34
5	Terramycin	6	10.34
6	Others	6	10.34
	TOTAL	58	99.97

Fig 2: Response to questionnaire survey on the most prescribed antibiotics.

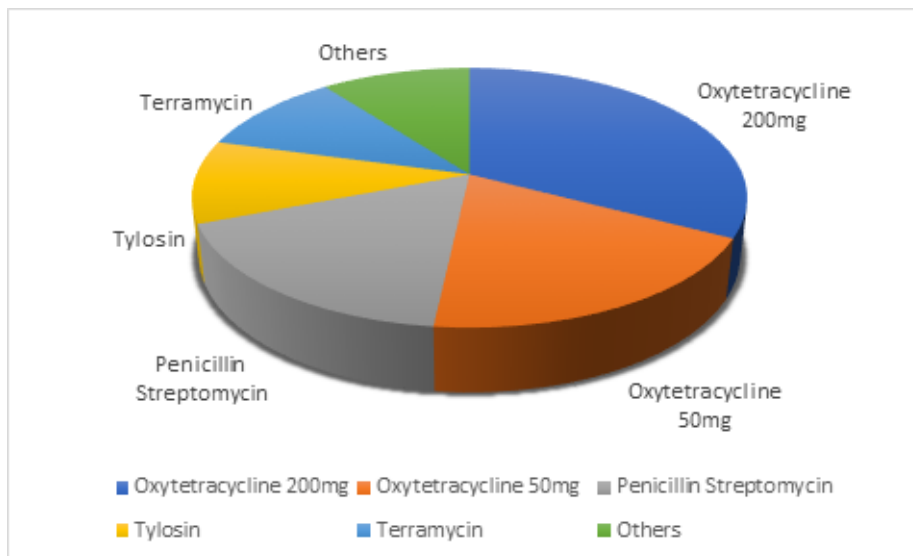
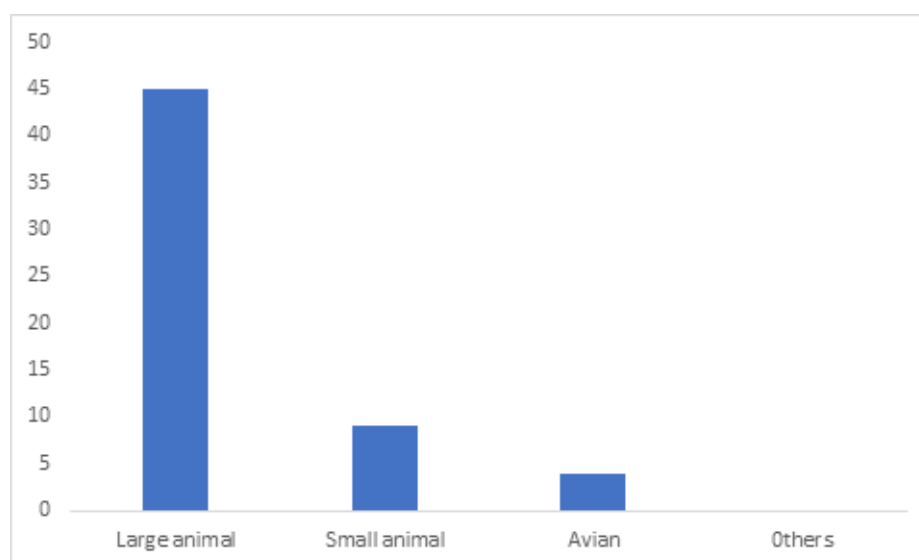


Table 3: Percentage of use of the antibiotics in the animal species

S/N	Specie	Number of respondents	% of respondents
1	Large animal	45	77.58
2	Small animal	9	15.51
3	Avian	4	6.89
4	Others	0	0

Figure 3: Frequency of use of antibiotics in animal species



Discussion

The recorded feedback from this research reveals that clinical inertia as a factor influencing decision making has the highest number of occurrences at 29.31% (17). This factor formed most underlying basis for on-the-field emergency treatments that are mostly administered tentatively. This can be partially due to the absence of rapid diagnostic kits or to a large extent, some levels of ignorance on the guidelines regarding antibiotic use. All respondents have a degree of ignorance about the rules governing the use of antibiotics. Since they are all Para veterinarians, they confessed to having little or no knowledge of the effects of antibiotic resistance and its consequences. Furthermore, many are not sufficiently trained in ethical prescribing procedures. It has been discovered that such training correlates with prescription of needless antibiotics (Machowska and Stålsby 2018). There aren't many active antibiotic stewardship programs (ASPs) in Sub-Saharan Africa (Akpan et al., 2020). Furthermore, when there are prescription guidelines for antibiotics, they are frequently disregarded (Fadare et al., 2019). Pharmaceutical corporations now attempt to influence the prescription of antibiotics by marketing their drugs to veterinarians, frequently with alluring incentives. As a requirement for professional certification, Para veterinarians prescribing abilities are rarely or never evaluated, and there is a dearth of specialized training in rational prescribing (Hassali et al., 2015). This study agrees with a review study conducted by Servia-Dopazo et al. (2021) who reported that veterinary health professionals' prescribing habits did not appear to be influenced by their socio-demographic characteristics, they were rather influenced by different attitudes, such as fear (identified in 19 out of 34 studies), self-confidence (19/34), business factors (19/34), and by complacency (16/34).

Thirdly, prescriber-related factors were observed as the decider for 20.68% (12) of respondents. This is due to lack of proper knowledge of the right antibiotic for the therapeutic effect which has led to prescribing antibiotics to manage secondary bacterial infections in viral infections.

Diagnostic uncertainties 12.06% (7) can lead to both over and under prescription of antibiotics (Liu et al., 2021) because vet health workers acted on intuitions either due to limited diagnostic resources or unwillingness of clients to pay for laboratory investigation.

It was also observed that 15.51% (9) of the respondents indicated that client demands significantly influence their decision-making process of prescribing antibiotics. Their clients specifically requested either one or both of fattening or prophylactic purposes. Additionally, even though clients may not know much about animal health, para-veterinarians must deal with livestock keepers' preferences, such as drug selection, which increases the risk of incorrect diagnosis, incorrect dose, and treatment selection (Ojo et al., 2016).

Numerous studies highlight the possibility of mis prescription due to para-veterinarians' explicit and implicit client expectations regarding antibiotics. For instance, some para-veterinarians reported that they believed their clients anticipated receiving medication as a concrete result of a consultation. Therefore, the health authorities must empower para-veterinarians to make sure that they feel accountable for leading the way in the sensible use of antibiotics and that this standard takes precedence over outside pressure (Smith et al., 2018). Legislation should be strengthened to discourage Para-veterinarians from prescribing antibiotics in the studied location.

The prevalent usage of antibiotics (i.e., oxytetracycline, penicillin-streptomycin Tylosin and Terramycin in that order) was largely due to its availability, affordability, and broad-spectrum activity. Different researchers have reported oxytetracycline as being the drug most widely used by farmers, para veterinarians, and veterinarians. Geidam et al. (2012), reported that oxytetracycline (36.5%) was the most marketed antibiotic and used by poultry farmers, even without a prescription, in Maiduguri. Daniel et al. (2021) also reported that the percentage use of Oxytetracycline by Veterinarians in the Veterinary Teaching Hospital Maiduguri was 55 % which is the highest occurrence, while Malgwi et al. (2023) reported the occurrence of Oxytetracycline residue in milk consumed in Maiduguri as a result of overuse of the drug. Aliyu et al. (2016) also reported that the percentage of use of antibiotics by animal health practitioners (veterinarians and para veterinarians) is 99.2% for oxytetracycline, which was the highest in Niger state. Oxytetracycline is said to be largely available and cheap, hence the high preference and utilization.

The abundance of large animal population in Nigeria, and especially the Northern region, ensured the high use of antibiotics in the treatment of major infectious diseases in the area. In a recent study, Aminu et al. (2021) showed that the ruminant population in Nigeria comprises 20,585,000 (Cow), 47, 926,000 (Sheep) and 84, 039,000 (Goats). Out of these, 88% of these are all from the North (Central, East and West). The high ruminant population in Northern Nigeria informed large ruminant medicine practice in the North. Information based on pastoralist knowledge as reported by Bolajoko et al. (2020), showed that CBPP is the most common infectious disease in Northeastern Nigeria, followed by Brucellosis, Tuberculosis and Foot and mouth disease (FMD). This finding was corroborated by Bawuro et al. (2022), Iorunshola et al. (2023) and Chukudi et al. (2024), as all the authors reported helminthosis as a major gastrointestinal parasite's infection in those ruminants. All these disease conditions in ruminants and small animals informed the frequent use of antibiotics for their treatments. Ruminants are food animals, and the constant use of antibiotics in food animals can escalate occurrences of antimicrobial resistance (Kasimanickam et al., 2021; Kupczynski et al., 2024), therefore, there is need to reduce antibiotics use in food animals.

Conclusion and Recommendations

It was concluded that the implementation of coordinated antibiotic stewardship programs among veterinarians, veterinary technicians, and other staff to optimize the use of antibiotics in animals is necessary. This can include guidelines and continues education for appropriate antibiotic selection, use, dosing, and duration of treatment, as well as monitoring and surveillance of antibiotic use and resistance patterns.

Most national and international veterinary conferences are now focused on drug resistance and residues because it has become a global concern for human and animal health.

Particularly concerning, is the existence of unlicensed animal health professionals in the community who profit from gullible customers despite lacking proper qualifications. This should prompt the Government and Veterinary Council to take strong punitive action to stem the tide of quackery.

Relevant antibiotic guidelines ought to be released by policymakers. Measures should be instituted to discourage para-veterinarians from prescribing antibiotics.

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