Avens Publishing Group
J Veter Sci Med
February 2024 Volume 12 Issue 1

Open Access Review Article

Journal of
Veterinary Science & Medicine

Review on Rational Use of Veterinary Drugs and Its Status in Ethiopia

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Submission: 05 December, 2023
Accepted: 01 February, 2024
Published: 09 February, 2024

Keywords: Veterinary Drug; Rational Use; Irrational Use; Ethiopia

Abstract

Over the past 100 years, medical care for animal diseases has evolved significantly. The purpose of this paper is to review the rational use of veterinary medicines and their current status in Ethiopia. Veterinary drugs are used rationally or irrationally in the livestock sector for therapeutic, prophylactic, and growth-promoting drugs, food preservation and processing, stress control in slaughterhouses prior to slaughter, and reproductive control. Rational use of drugs is the use of the right drug, in the right amount, at the right cost, and at the right time. Irrational use of veterinary drugs is a major problem when used in food-producing animals. Reasons for irrational drug use include poor communication between owners and professionals, inadequate training and education of veterinary graduates, demands from owners, and lack of diagnostic equipment. Irrational use of drugs can negatively impact public health, including: decreased quality of drug therapy leading to increased mortality and morbidity; increased risk of undesirable effects (emergence of drug resistance and side effects); waste of resources leading to decreased availability of other important drugs; increased costs; adverse, sometimes increased, in some cases lethal, effects, and so on. To promote the rational use of drugs, WHO has announced 12 core interventions. In Ethiopian veterinary clinics, there were problems with correct diagnosis, low prescriber education levels, the presence of a small number of essential drugs, the absence of a standard veterinary drug list, and inappropriate drug use leading to irrational drug use. Therefore, attention should be paid to proper diagnosis, educational status of prescribers, different types of drugs, and meeting all the customs of the national veterinary drug lists and guidelines..

Introduction

Therapeutics for animal diseases has evolved significantly over the past century. A wide variety of drugs are available, but only a few are approved for use in animals for specific indications. The relative paucity of veterinary medicines approved for a wide variety of animal species results in veterinarians using products outside of the approved conditions of use detailed in the Summary of Product Characteristics to treat disease and relieve suffering [1].

Veterinary drugs are used rationally or irrationally in the livestock sector as cures, prophylactics, and growth promoters. The concept of rational drug use is ancient, as evidenced by the words of the Alexandrian physician Herophilus in 300 B.C.: “Drugs are of no use in themselves, but are the very hand of God when used with reason and prudence. Rational drug use has taken on greater significance today from medical, socioeconomic, and legal aspects [2].

Rational use of drugs is the use of the right drug, in the right dosage, at the right cost, and at the right time, as is often reflected in the World Health Organization (WHO). On the other hand, irrational use of drugs is defined as “too many prescriptions per patient, injectable drugs being used when oral formulations would be more appropriate, inappropriate antimicrobial prescription quantities or regimens, antibiotics being prescribed for nonbacterial infections, prescriptions not following clinical guidelines, inappropriate self-treatment or not adhering to prescribed therapy” [3]. Inappropriate use of drugs can lead to ineffective treatment, unnecessary waste of resources, and harm to patients [4].

The irrational use of drugs in veterinary medicine and the need to control their use is an even greater problem when they are used in food animals. In this case, trace amounts of the drug or its metabolites remaining in edible tissues and animal products (meat, milk, eggs, honey) can cause certain harmful effects on humans, the potential consumers of such foods [5]. To prevent this risk, drugs should be used rationally, i.e., only when truly indicated, in the right way, at the right time, in the right dose, and with a withdrawal period. In addition, sensitivity to antimicrobial agents should be regularly controlled and residues of antimicrobial agents commonly used in veterinary practice should be regulated [6].

Ethiopia is a treasure trove of livestock and is considered to have the largest number of livestock in Africa. The Central Bureau of Statistics reports that there are approximately 60.39 million head of cattle, 31.3 million sheep, 32.74 million goats, 56.06 million poultry, 2.01 million horses, 8.85 million donkeys, 460,000 mules, and 1.42 million camels in the settled areas of the country[7]. However, despite this huge livestock population, Ethiopia is not utilizing its livestock resources as expected due to a number of factors, including livestock diseases, recurrent droughts, infrastructure problems, the spread of livestock diseases, poor nutrition, improper husbandry practices, lack of trained personnel, and government policies regarding disease prevention and control [8]. Widespread livestock diseases are a major constraint to livestock development in Ethiopia [9] ,and as a result, veterinarians use anthelmintics and antibiotics to treat these diseases.

In Ethiopia, studies conducted on humans in hospitals in different regions of the country revealed the presence of irrational drug use [10]Similarly, in veterinary medicine, studies reported in central Ethiopia [11-13] showed the presence of irrational use of veterinary drugs in veterinary clinics in Bishoft, Adama District and Mojo, respectively.

ISSN: 2325-4645

Therefore, the purpose of this paper was:

- ➢ To review the rational use of veterinary drugs.
- ➢ To show the use of veterinary drugs in Ethiopia.

Literature Review

Uses of Veterinary Drugs

Veterinary medicines play an important role in livestock production and are generally used in livestock for therapeutic and preventive purposes, growth promotion, feed preservation and processing, and stress control before slaughter, and can be administered in feed or in drinking water [14]. Prophylactic use refers to the use of a drug by an individual or group to prevent the onset of an infectious disease, while therapeutic use refers to the treatment of an established infectious disease. Both prophylactic and therapeutic use involve short-term administration of therapeutic levels of drugs through different routes [15]. The use of antimicrobials as feed supplements can promote growth and increase feed efficiency in food animals [16].

Antimicrobial agents are compounds that kill pathogenic microorganisms in the animal body without adversely affecting the host. Antimicrobials are natural products of various species of bacteria and fungi that cause the death (bactericidal effect) or growth inhibition (bacterio static effect) of microorganisms at low concentrations [17].

Therapeutic and prophylactic use: The use of antimicrobials in healthy animals considered to be at risk of infection or before the onset of clinical infection implies disease-preventive use (prophylactic use) of antimicrobials. This includes the prevention of infections that have not yet been clinically diagnosed or their use to control the spread of clinically diagnosed infections identified in a group of animals. The use of antimicrobials for the specific purpose of treating animals with clinically diagnosed infections or diseases is referred to as therapeutic use of antimicrobials [18].

Therapeutic and prophylactic drugs, divided into different groups according to their action, such as antiparasitic, antibacterial, and antifungal drugs, are the most widely distributed drugs and are used to treat and prevent animal diseases[19].

Growth promoters: A growth promoter is any antimicrobial agent that is administered in low doses below the therapeutic dose and destroys or inhabits the growth of microorganisms that reduce animal food yield as infectious pathogens[20]. Antibiotic growth promoters are used to aid animal growth by reversing the percentage of weight again to improve feed saving efficiency [16].

A variety of compounds with growth-promoting properties can be found in various veterinary drugs. Typical examples are β-adrenergic agonists, which are intended to increase growth efficiency and meat percentage in the carcass, especially by promoting protein synthesis and reducing fat content. Antithyroid agents and corticosteroids can be applied alone to increase food intake, weight gain, fat content and water retention, or in combination with β-agonists to increase water content in meat, or with anabolic steroids [21].

Preservation and processing of food: A preservative is a substance that can inhibit, delay, or prevent the growth of microorganisms or other deterioration caused by their presence. Food preservatives extend the shelf life of certain foods. Preservatives slow microbial deterioration and thus preserve the color, texture, and flavor of foods. Food preservatives can be classified as natural or artificial. Artificial preservatives are produced industrially. They are classified as antimicrobial, antioxidant, and anti-enzyme agents [22].

Food additives are added in food preservation and processing to prevent spoilage, promote binding, and enhance flavor and nutritional value. These additives include sequestering agents, antioxidants, stabilizers, colorants, softeners, and sweeteners. Residues and contaminants can enter the food chain through intentional exposure to these chemicals during both the production and processing stages [23].

Pre slaughter control of stress in abattoir: Transportation of animals to slaughterhouses is a process that involves exposing animals to many stressful stimuli, including environmental, psychological, and physiological factors. A common practice in the meat production industry is to use medical procedures to prevent stress, avoid market penalties (i.e., low demand low price) for poor quality meat that may be directly attributable to transportation to slaughterhouses, and minimize economic losses due to the health of animals prone to stressful conditions It is to minimize the economic losses due to stressful animal health [24].

In the past, treatments involving tranquilizers were often used to reduce stress in animals. However, the use of such tranquilizers has been banned in the EU due to the risk of residues in meat, and there is an urgent need to find new ways to calm animals during transport. One possible solution is the use of a legally approved additive. This additive can be administered by mixing it into the animal's food or drinking water, and its effects on stress reduction and meat quality are well known. Currently, the selection and application of drugs (agonists, antagonists, dopaminergic agonists, benzodiazepine opiates, barbiturates) and dietary supplements (magnesium, vitamins, amino acids) as anti-stress agents is empirical and scientific justification in terms of stress neurochemistry is usually not available [24].

Control of reproduction: Prostaglandins are reproductive hormones used to manipulate reproduction in cattle. Its two main uses in the export trade of live cattle are to terminate unwanted pregnancies and to synchronize estrus prior to artificial insemination of breeding cows. Unwanted pregnancies can be terminated by administering prostaglandins 7 to 150 days after conception. Administration of prostaglandins between 7 and 100 days after conception will reliably induce abortion after 3 to 5 days with relatively few complications. Estrus synchronization is always performed under the guidance of an AI center or veterinarian familiar with cattle reproduction and has few problems as long as the cows are healthy and not pregnant [22].

Sex steroids, prostaglandins and their analogues are used to regulate reproductive and fertility programs. Prostaglandins

ISSN: 2325-4645

and glucocorticoids are used to control the timing of calving and as abortifacients. Shortly after treatment, animals are not slaughtered, and residue problems in meat can occur only in cases of causal slaughter [23].

Ways of Veterinary Drug Use

Rational veterinary drug use: Rational use of veterinary medicines means that sick animals receive the appropriate amount of medicine for their clinical needs, for the appropriate duration, and at the least cost [23]

This requirement is met if the prescribing process is properly followed. This includes defining safe and effective treatments (non-drug and drug), procedures for defining (diagnosing) the patient's problem, writing the prescription, providing appropriate information to the patient, selecting appropriate drugs, regimens, and doses, and planning for evaluation of treatment efficacy [23].

Promoting rational drug use requires a wide range of activities, including adaptation of the essential drug concept, ongoing training of health professionals, and development of evidence-based clinical guidelines. Unbiased and independent drug information, consumer education, and regulatory strategies are also essential to promote rational drug use [3].

Irrational veterinary drug use: Unreasonable use of a drug means misuse of the drug by the patient (i.e., administration of a drug inappropriate to the patient's clinical needs, under- or over-dosing that is not commensurate with the patient's individual needs, inadequate duration of administration) [14] i.e., under prescribing, overprescribing, incorrect prescribing, extravagant prescribing, and multiple prescribing [25].

Under prescribing

Indicates instances in which the dosage or duration of treatment is inadequate or necessary drugs are not prescribed. This is the case, for example, when the dosage is inadequate for the patient's weight [26]. However, there are also cases where a physician decides not to prescribe a drug after due consideration, which is considered reasonable underprescribing [27]. reported that in 65% of patients, the prescribing physician decided not to prescribe a particular drug after due consideration. Underprescribing is a potential cause of significant morbidity and mortality, but it remains a less noted issue in the field of drug use [28].

Overprescribing: This refers to cases in which a drug is prescribed without an indication, or even if indicated, the duration of treatment is too long, or the amount of drug given to the patient exceeds what is necessary for the current course of treatment. For example, this is the case when antibiotics are given for days for a mild infection that can be treated for a few days, or when antibiotics are initially prescribed when a viral infection is suspected [29].

Inappropriate prescribing: this can occur when a medicine is prescribed because of an incorrect diagnosis or when the prescription is not properly written or does not take into account the genetic, medical or environmental characteristics of the patient [28]. For example, when a physician fails to take into account if a patient has allergies that may be triggered by the newly prescribed medication. It is also considered inappropriate prescribing if the physician does not take into account that prescribing a particular drug may react with the patient's current treatment (e.g., prescribing a serotonergic antidepressant to a patient who is already taking a monoamine oxidase inhibitor) [30].

Extravagant prescribing: presumably occurs when doctors prescribe more expensive drugs despite the availability of cheaper drugs with comparable safety and efficacy, or when doctors treat patients symptomatically rather than addressing the underlying serious condition. For example, prescribing unnecessarily expensive cough medicines has provided little benefit compared to commonly available less expensive options. Similarly, extravagant prescribing is said to occur when a class of patented drugs is prescribed even though there are cheaper generic alternatives in the same class that can be used without compromising treatment. Such classes include renin angiotensin angiotensin inhibitors, proton pump inhibitors and statins [31].

Multiple prescribing: when two or more medicines are prescribed and fewer than one of them will have the same effect, or when the prescriber is treating several related diseases, even if the treatment of the underlying (primary) disease may cure or treat other diseases [25].

The irrational use of drugs is of particular concern due to the development of resistant bacteria. The abuse and heavy use of antimicrobials has made them a serious problem in both human and veterinary medicine [32]. Widespread misuse of authorized drugs has led to the discovery of undesirable residues in food of animal origin. Non-compliance with recommended withdrawal and retention times for antimicrobials is also widespread [33].

Unnecessary medicines may be prescribed, such as high doses of multivitamins to patients without nutritional problems or antibiotics to patients without evidence of bacterial disease. For the use of medicines to be reasonable, they must be effective, safe, prescribed for the right therapeutic indication, in the right dosage, in the right formulation, easily available and at a reasonable cost [34].

Significance of Rational Veterinary Drug Use

Rational use of drugs in veterinary medicine is of important public health and economic importance. and economic significances.

Public health significance: When veterinary medicinal products are used at appropriate doses and levels, adverse human health effects occurring in food have not been reported [35].

Improve food safety concern: When veterinary drugs are used rationally, the potential adverse effects of animal consumption of food products are small. However, when veterinary drugs are used irrationally, mainly in food animals, very small amounts of the drug or its metabolites (residues) in products of animal origin (meat, milk, eggs, honey) can cause

ISSN: 2325-4645

specific adverse effects in humans, potential consumers of such products [6].

Reduce the development of drug resistance: The very high incidence of resistance to antimicrobials used for treatment and growth promotion in food animal husbandry has been observed in several studies. However, most reports are based on survey studies and are severely hampered by the lack of appropriate epidemiological selection criteria and reliance on pathogens isolated from clinically pathological and possibly dosed animals. Information on resistance outbreaks at local, regional or international level is needed to guide policies and detect changes that require response strategies. To meet this requirement, a system for continuous monitoring of changes in resistance epidemics is needed [36].

Resistant microorganisms are transmitted to humans either by direct contact or indirectly through milk, meat or eggs. Contamination of food of animal origin with bacteria from the endogenous flora of food-producing animals can lead to human infection, transfer of resistance genes to the human endogenous flora, or a new load on the reservoir of resistance genes already present in humans [37].

In addition, the rational use of medicines can significantly minimize the risk of microorganisms acquiring resistance (in the case of antimicrobials). Therefore, when veterinary medicines are used at appropriate doses and levels, a significant proportion of adverse human health effects occurring in food have not been reported [35].

Reduce the development of drug residue: Humans consume protein-rich foods, mostly of animal origin, to meet their nutritional requirements. In some countries, the safety of foods of animal origin has focused on preventing the transmission of zoonotic diseases, while less attention has been paid to potentially present chemical residues [21]. Today, growing consumer awareness of the increasing chemicalization of foods of animal origin (meat, milk, eggs and their products) is a challenge facing the dairy, meat and poultry industries. Many chemicals are used directly or indirectly in the production, processing and storage of animal products. On the other hand, environmental pollution due to increasing urbanization and industrialization, as well as the inappropriate use of veterinary drugs, can also lead to the presence of residues in food [38].

Chemical contaminants are potentially harmful chemicals of human or natural origin that can be present in food through intentional handling or accidental contamination during food production, processing and storage. Contamination of food by pathogenic microorganisms and residual chemicals can occur during production, transportation, storage, distribution and preparation for consumption at the farm level [11].

Foods of animal origin can be contaminated with one or more of the thousands of manufactured chemicals used in the community. Relatively few chemicals are regularly found in animal foods and the most problematic residues (in terms of likelihood of occurrence and impact on human health, trade and consumer confidence) are antimicrobial agents, hormone growth promoters and production aids, polyhalogenated hydrocarbon pesticides, industrial chemicals and heavy metals 38. Some of the manufactured chemicals in food are additives used intentionally for production, processing and preservation. Some of these, e.g. nitrites, are of concern as toxic metabolites (e.g. nitrosamines) can form in food before ingestion. Chemical residues (e.g. iodine, chlorine, bromine) are also contaminants due to hygiene procedures and some are occasionally transferred from packaging materials [11].

One of the most important problems of food contamination is veterinary drug residues. Human health can be affected by drug residues in foods of animal origin and can cause direct adverse effects. In general, the consequences of antibiotic residues in foods of animal origin are significant compared to the misuse of antibiotics and the selection and proliferation of antibiotic-resistant bacteria [20]. Foods of animal origin, such as meat, milk and eggs, may have residues of veterinary drugs in edible tissues after harvest. In some countries where farmers/producers comply with legal directives, residue levels of veterinary drugs are within safe limits. However, in a relatively small number of cases, residue levels exceed the maximum permitted limits. This is due to inappropriate/irrational drug use and is therefore not legally permitted in the food system [39].

Economic significance: A wide spread availability and use of antimicrobials have several negative implications on global health care; development of drug resistance is one of among these. The primary economic implications of resistance on the diminishing efficacy of antibiotic treatment includes the need to rely on more expensive drugs that may be practically unaffordable for most primary health care programs [19]. From the prospective of international trade and consumer confidence antimicrobial residue remains very significant, because it results barrier of international trade. As tariffs are removed and goods flow freely between countries, importing countries must be in confident that goods available for purchase are safe, and in addition to this, from time to time, there is pressure to use antimicrobial residues on non-tariffs barrier to importation. Major economic loses and animal welfare problems could arise in veterinary medicine, because antimicrobial resistance has been found to cause therapy failure and higher morbidity and mortality rate [15].

Reason for Irrational Use of Drugs

There are several reasons for irrational drug use. These include poor communication between animal owners and professionals, lack of information, inadequate education and training of medical and veterinary graduates, demands of animal owners (clinicians prescribe drugs for every complaint to meet patients' expectations and demands for early relief) and lack of diagnostic facilities/uncertainty of diagnosis. There is also the idea that 'there is a drug for every disease'. All this increases the tendency towards polypharmacy, imperfect drug supply systems, promotional activities of pharmaceutical companies and ineffective drug regulation (the absence of a well-organized drug regulatory authority and the large number of drugs on the market leads to irrational use of drugs) [40].

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Lack of information: Unlike in developed countries, there is no regular facility to provide up-to-date and unbiased information on currently used medicines. The majority of general practitioners rely on health professionals for information on medicines. There are differences between pharmaceutical companies and drug regulatory authorities in the interpretation of data on the efficacy and safety of medicines [41].

Inadequate training and education in medical injections and cough and cold medications: injections have graduated: lack of adequate clinical training in writing proper prescriptions during the training period and increasing over-reliance on diagnostic aids rather than improving clinical diagnostic skills [40].

Poor communication between health workers and patients: health workers and other health professionals spend too little time with patients and do not explain basic information about the use of medicines, do not give prescriptions to patients and stop talking to them [42].

Lack of diagnostic facilities/uncertainty of diagnosis: Accurate diagnosis is an important step for rational medical care. Doctors working in remote areas face many difficulties in reaching the correct diagnosis due to lack of diagnostic facilities. This encourages polypharmacy [41].

Patient demand: To meet patients' expectations and satisfy their demand for quick relief, clinicians prescribe medication for all complaints and provide symptomatic treatment. There is also the belief that 'for every disease there is a cure'. These have increased the trend towards polypharmacy [42].

Flawed drug supply systems and ineffective drug regulation: the absence of a well-organized drug regulatory authority leads to irrational use of medicines [42].

Drug promotion: lucrative promotional programs of various pharmaceutical industries influence drug prescribing [41].

Consequences of Irrational Use of Drugs

Irrational use of medicines can have negative public health consequences, including reduced quality of drug therapy leading to increased mortality and morbidity (limited efficacy) and increased risk of adverse effects such as the emergence of drug resistance due to widespread overuse of antibiotics, use of lower than therapeutic doses, increased side effects and waste of resources, leading to reduced availability of other important medicines, increased costs and adverse, possibly fatal, effects [40-43].

A study in one region in India found that 69.2 percent of pharmaceutical expenditure is wasted in the private sector and 55.4 percent in the public sector. In this region, 14.76 billion rupees were wasted on irrational prescribing in a single year, accounting for 67.58 percent of the region's total drug consumption. Irrational prescribing also has a negative psychosocial impact, as it perpetuates the notion that 'every condition needs a medicine' [43].

The overuse of antimicrobials and anthelminthic in veterinary practice contributes to the development of intrinsic or acquired antimicrobial and anthelminthic resistance in both food and companion animals. Acquired resistance develops as a result of intensive and irrational use of drugs, while intrinsic resistance is the result of natural structural or functional traits that confer resistance to a particular drug or class of antimicrobials. Antimicrobial/anthelminthic resistance is a growing problem and indeed the development of new drugs may not be the solution. Common causes of antimicrobial resistance include unnecessary use of antimicrobials, inappropriate dosage, inadequate duration of treatment and irrational use of antimicrobial combinations [11].

Side effects, including misuse of antimicrobials, which can be fatal; limited efficacy of antimicrobials, TB drugs and leprosy drugs, e.g. due to inadequate therapeutic doses; antimicrobial resistance due to overuse or inadequate therapeutic doses of antimicrobials; drug dependence, e.g. through routine use of analgesics and tranquilizers; risk of infection through inappropriate use of injections, e.g. injection abscesses Waste of resources; reduced availability of other important medicines, increased costs. Risk of infection through inappropriate use of injections (such as injection abscesses); waste of resources; reduced availability of other important medicines; increased costs [40].

Measures to Promote Rational Veterinary Drug Use

The importance of promoting the rational use of medicines is evident from the fact that various initiatives in this direction have been incorporated into health systems at both national and international level. In addition to a wealth of information, educational resources for medicines and therapeutic committees are available in downloadable format from the website. For example, WHO publications such as the Good Prescribing Guidelines are easily downloadable [43]

Keep all food animals in as clean and healthy an environment as possible. Feeding programs should meet the needs of lactation, growth and maintenance periods. Health programs, including preventive medical procedures, should be carried out by veterinarians. Unnecessary and incorrect use of medicines is best prevented by implementing health programs and management practices that keep animals healthy and enable them to produce efficiently [15].

There are several strategies to minimize the misuse of antimicrobials. These include: education to raise awareness among farmers; training of prescribers and dispensers (including drug sellers); ensuring that only antimicrobials that meet international standards for quality, safety and efficacy are allowed for sale; establishing and maintaining up-to-date national standard treatment guidelines; limiting access to antimicrobials by prescription; reducing the need for antimicrobials by developing guidelines for veterinarians and strengthening immunization coverage and other preventive measures to reduce misuse and overuse of antimicrobials in food-producing animals [15].

Failure to adhere to recommended withdrawal periods often leads to residue problems and it is therefore advisable to

ISSN: 2325-4645

adhere to recommended withdrawal periods to avoid residual effects of medicines on animal food. This means that prescribed withdrawal periods for specific medicines should be established and adhered to, and food animals should not be sold for slaughter or slaughtered before the withdrawal period has expired [14].

To promote more rational use of medicines, WHO has published 12 key interventions. These include clinical guidelines, public education on medicines, appropriate and mandatory regulations, independent information on medicines, surveillance, audit and feedback, and problem-based drug therapy education in undergraduate curricula [44].

Prescribing Indicators

There are no existing guidelines on prescribing indicators used in veterinary medicine. As a result, the WHO prescribing indicators presented below were considered most appropriate as prescribing indicators for use in veterinary research. This indicator has been pre-tested and slightly modified to be consistent with clinical practice in veterinary medicine so that it can be used to provide accurate data [45].

The final versions of the pretested indicators are:

1. To measure the extent of polypharmacy, the total number of different medicines prescribed was divided by the number of cases studied to calculate the average number of medicines prescribed per case. The combination of medicines prescribed for a health problem was fixed and counted as one;

2. the percentage of medicines prescribed in generic name was calculated by dividing the number of medicines prescribed in generic name by the total number of prescribed medicines and multiplying by 100 to measure the propensity to prescribe in generic name;

3. The proportion of consultations where antimicrobials, anthelmintics and other medicines were prescribed was calculated by dividing the number of consultations where medicines were prescribed by the total number of consultations reviewed and multiplying by 100 to measure the overall use of overused (unreasonably prescribed) and expensive drug therapies.

4. The proportion of drugs prescribed from the Ethiopian National Veterinary Drug List (EVDL) was calculated as the total number of drugs prescribed divided by the total number of prescribed items on the veterinary drug list to measure the extent to which the practice complies with the national drug policy as described in the Ethiopian EVDL and divided by the number of prescribed items and multiplied by 100 [46].

5. The rational use of veterinary medicines means that sick animals receive the medication appropriate to their clinical needs, for the appropriate duration, in the dose that meets appropriate individual requirements and at the lowest cost to the patient and society [23]. Irrational drug use, on the other hand, means that patients misuse drugs (i.e. patients are given too much or in doses that are not appropriate for their clinical needs, for the appropriate duration, in doses that do not meet appropriate individual requirements) [47].

Veterinary drug use patterns/status in Ethiopia

Several studies on the rational use of veterinary drugs in Ethiopia have shown that irrational drug use is very common in the study area: In a study by [12], antimicrobials were irrationally prescribed for viral diseases (16.2%) and surgical cases (5.6%), anthelmintics were also irrationally prescribed for bacterial diseases (2.9%) and surgical cases (0.9%); In a study by [13], anthelmintics were irrationally prescribed for bacterial (28.7%), metabolic (7%) and viral (3.8%) diseases and antimicrobials were irrationally prescribed for viral (26.2%), parasitic (8.6%), surgical (0.2%) and metabolic diseases (0.9%). [48] also reported that anthelmintics were prescribed for 44.3% of non-parasitic diseases at Gondar University Veterinary clinics.

The route of administration was not specified in 96.5% [13],99.1% [12] and 98.9% [11] of prescribed medications, contributing to the presence of irrational drug use.

A study on the educational status of prescribers showed that the majority of prescribers at Mojo Veterinary Hospital were animal health assistants (67.9%) or at diploma level, while only 32.06% were veterinary surgeons. This study is in line with similar studies conducted at Adama VeterinaryClinic 88.1% and 11.9% [12], VTH-CVMA and Ada District Veterinary Clinic where 70.8% and 29.2% [11]of prescriptions were written by animal health assistants and veterinary surgeons respectively. This suggests that the level of education of those prescribing veterinary medicines is low and care needs to be taken to avoid treatment errors, misuse of medicines and development of drug resistance.

Ethiopia's Federal Constitutional Decree No. 728-2011 stipulates that veterinary medicines should only be prescribed by veterinarians. It also states that veterinarians must follow prescribing procedures and prescribe veterinary drugs on standard prescription forms [49]. 98.2% of patients admitted to Mojo Veterinary Clinic [13], CVMA-VTH and Adama District Veterinary Clinic [11] and 96.6% of patients admitted to Adama District Veterinary Clinic [12] received empirical treatment and did not receive a correct definitive diagnosis (laboratory support). This suggests that affected animals were treated only on the basis of a provisional diagnosis. This suggests that affected animals were not managed with specific treatment or that drugs were used irrationally without knowing the specific cause of the disease.

Conclusion

The review of this paper reveals the rational use of veterinary drugs in Ethiopia and its pattern/situation. Veterinary medicines are used rationally or irrationally in the livestock sector. Rational use of medicines is the use of the right medicine, in the right quantity, at the right cost and at the right time. Irrational drug use can have negative effects on public health: reduced quality of drug treatment leading to increased mortality and morbidity; increased risk of adverse effects such as drug resistance and the emergence of side effects; wastage of resources making other important medicines unavailable; increased costs and, in some cases, fatal side effects, among others. Studies in Ethiopia

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have shown that accurate diagnosis of disease and selection of appropriate drugs is problematic; lack of laboratory tests, low education levels of prescribers, availability of few essential drugs, lack of a national veterinary drug list and standard veterinary drug treatment guidelines, standard prescription forms, standard case forms and case registers are of high public health importance and lead to irrational drug use. Therefore, correct diagnosis and appropriate diagnosis selection practices should be carried out, clinical examination, educational status of prescribers, different types of drugs, national veterinary drug lists and guidelines, standard prescription forms and case records, and all issues related to these that lead to irrational drug use should be met and paid attention to. What to pay attention to. Appropriate medicines should be prescribed in appropriate doses, routes and regimens. Laboratory support for confirmation of provisionally diagnosed diseases should be provided and laboratory equipment, chemicals and reagents should be enriched. Governments, private veterinary practices, private veterinarians and animal owners should promote the rational use of medicines. Veterinarians should be made aware of the irrational use of veterinary medicines and their impact on public health.

Conflicts of Interest

The author declares that there are no conflicts of interest regarding the publication of this article.

Authors' Contributions

TekluYitbarek was responsible for all things related to this review.

Acknowledgments

I would like to thank the Almightily GOD for giving me strength to do this review.

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