



Assessment of Rational Use of Veterinary Drugs in Modjo Veterinary Clinic, Ethiopia

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ABSTRACT

A retrospective study was conducted from November 2017 to April 2018 at Modjo veterinary clinic in East Shoa zone, Oromia region, central Ethiopia with the aim of evaluating the current rational use of veterinary drugs on live stock. In this study, a total of 1660 drug products were prescribed for a total of 1500 randomly selected animal patients. The average number of drugs prescribed per encounter was 1.11 with maximum of three. The percentage of antimicrobials and anthelmintic encountered were 60.41% (1003/1660) and 35.24% (585/1660), respectively. The most commonly prescribed antimicrobials were oxytetracycline 864 (52.04%), penicillin and streptomycin combination 136 (8.19%) and anthelmintics were ivermectine 560(33.7%) and albendazole 17(1.02%). Among all patients admitted to Modjo veterinary clinic 98.2% were treated empirically, without getting correct definitive (laboratory supported) diagnosis. Antimicrobials were prescribed irrationally for cases which were tentatively diagnosed as parasitic 8.6%. Besides, anthelmintics were prescribed irrationally for cases which were tentatively diagnosed as bacteria 28.7% and viral 3.8%. The finding has shown problems in generic prescribing, incorrect diagnosis, over use of drug and misuse of drugs. Therefore improve availability of key essential drugs on stock through good drug supply management to reduce misuse of drugs and therapeutic failure is recommended.

Keywords: Antimicrobial, Anthelmintic evaluation, Irrationally, Rational

The terms *antimicrobial*, *antibiotic*, and *anti-infective* encompass a wide variety of pharmaceutical agents that include antibacterial, antifungal, antiviral, and anti parasitic drugs. Antimicrobial drugs have been widely used for more than 50 years to improve both humans and animal health since the antibiotic golden age up to date. The discovery of antibiotics and antibacterial agents since 1940s revolutionized the treatment of infectious bacterial disease that killed millions of people and animals during the pre-antibiotic golden age worldwide (EFSA, 2009).

Veterinary drugs are used in livestock sector either rationally or irrationally as therapeutic, prophylactic and growth promotion. Rational use of drugs is based on the use of right drug, at right dosage, right cost and right time which is well reflected in the world health organization (WHO, 2012). Whereas irrational use of drug means misuse of drugs by the patient (i.e. patients receive

medications inappropriate to their clinical needs, under or over dosing that meet their own individual requirements, and for inadequate period) (Hanmant and Priyadarshini, 2011).

Irrational use of drugs is a huge worldwide problem and extra care should be taken especially in pregnancy, for example unnecessary drugs are sometimes prescribed like multivitamins in large quantities for patient without nutritional problems or antibiotics, for patients without evidence of bacterial illness (Akhtar *et al.*, 2012).

Misuse, under dose and over use of antimicrobial and anthelmintic in veterinary practice, for both food producing and companion animals, favors the development of drug

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resistance (VMD, 2008). Currently the emergence of antibiotic/antibacterial resistance due to irrational drug use in medical and veterinary practice, food industries, agriculture and in communities is posing a global health problem (Batasset *et al.*, 2007).

Globally, more than half of all medicines are prescribed, dispensed or sold improperly, and 50 % of human patients fail to take them correctly. This is more wasteful, expensive and dangerous, both to the health of the individual patient and to the population as a whole that magnifies the problem of misuse of antimicrobial agents (WHO, 2004).

To prevent this problem, it is necessary to promote and use drugs rationally like; careful attention on diagnosis of disease, selecting appropriate drug for the treatment of the diagnosed disease, route of drug administration, dose of drug, contraindications to the patients, withdrawal period of a drug and duration of treatment (Rehan *et al.*, 2001; Matter *et al.*, 2007). Promotion of rational drug use involves a wide range of activities such as adaptation of the essential drug concept, continuous training of health professional and the development of evidence based clinical guidelines. Unbiased and independent drug information, consumer education and regulatory strategies are also vital to promote rational drug use (Almarsdottir and Traulsen, 2005; Seiter, 2010). In addition, promoting the rational use of medicines requires effective policies as well as efficient teamwork between health professionals, patients, and entire communities. Adequate understanding regarding the relevant aspects of antimicrobial use on the part of all stakeholders is essential to drive collaborative efforts towards addressing the problem of irrational drug use (WHO, 2012).

Some research paper published on the evaluation of rational use of drugs on human in some parts of our country, Ethiopia revealed the presence of irrational drug use (Endale *et al.*, 2013). Similarly, in veterinary medicine, a study conducted by Beyene *et al.* (2016) on rational use of veterinary drugs at Bishoftu veterinary clinic, central Ethiopia showed irrational drug use. Nevertheless, no research has been conducted on the rational use of drugs in Modjo veterinary clinic. Therefore, the objectives of this study are:

- To evaluate rational use of veterinary drugs on live stock at Modjo veterinary clinic.

- To compare magnitudes of different drugs commonly used for the treatment of animal diseases at Modjo veterinary clinic.

MATERIALS AND METHODS

Study area and period

The study was conducted from November 2017 to April 2018 at modjo veterinary clinic in East Shoa zone of Oromia region central Ethiopia, about 70 km south east of Addis Ababa. It is located at 39' E longitude and 839'N latitude with an elevation between 160 and 200 meters above sea level in the rift valley with a temperature of 17.1°C to 22.2°C. The area receives an annual rain fall ranges between 750 mm – 875 mm and with average relative humidity of 41.8%. The area has two rainy seasons, the long rainy season and the short rainy season. The rainy seasons extend from June to September the highest while short rain occurs from February to May.

Study population

The livestock population of the area comprises of 131505 cattle, 38985 sheep, 40305 goats, 892 horses, 934 mules, 29357 donkeys and 105411 heads of chickens (CSA, 2007). The study was conducted on animals (cattle, sheep, goats, equines, pets and chicken of all ages and sex groups) that were treated with drugs from 2012 to 2017, at Modjo open air veterinary clinic, but those animals which received no medicines was excluded from the study population.

Study design

A retrospective and cross-sectional study was conducted from November 2017 to April, 2018 to assess rational use of veterinary drugs at Modjo veterinary clinic. The samples were selected using a systematic random sampling method; the sampling units were animals treated at Modjo veterinary clinic from 2012 to 2017 G.C. Drug use was evaluated based on (WHO, 2012).

Data collection

Data collection format was designed and the data was collected on prescribing indicators retrospectively by using both patient case registration books in Modjo

veterinary clinic. The specific data necessary to measure the prescribing indicators was recorded for each animal patient encounter and entered into an ordinary prescribing indicator form. For this particular study, 1500 prescriptions that contain the animal's individuality (age, sex, body condition, clinical signs and symptoms observed), disease diagnosis (name, empiric or physical clinical examination and confirmatory laboratory tests used), prescribed drugs (type, naming [generic or brand], number of drugs prescribed, route of administration, duration of treatment, availability in the national veterinary drug list), prescriber's signature, level of education and years of experiences were collected retrospectively from more than 24000 prescriptions written for the last 5 years (from December 2012 to April 2017 GC). The availability of both veterinary treatment guidelines and national veterinary drug list (EVDL) in the clinic was also observed. Accordingly, evaluation of rational use of veterinary drugs was made based on generic prescription, and antimicrobials and anthelmintic prescribed for tentatively diagnosed clinical cases (Beyene *et al.*, 2016).

Data analysis

All data in the ordinary prescribing indicator recording form were entered into Microsoft Excel spread sheet (version 2010) and imported then analyzed using SPSS (Version 20). Means, median, range and frequencies (percentage) were used to describe patients' characteristics. The Chi Square test was used to compare categorical variables where appropriate or to determine the association between drug prescribed and disease diagnosed. All statistical tests were two sided and P values ≤ 0.05 was considered significant.

Prescribing indicators

There was no available guideline for prescribing indicators used in veterinary medicine. As a result the WHO prescribing indicators were used in this study (Desalegn, 2013). The indicators were pretested, and slightly modified to match with clinical practice in veterinary medicine so they could be used to provide accurate data. The final versions of the pretested indicators are to measure: Degree of polypharmacy, calculated by dividing the total number of different drug products prescribed with the number of encounters; prescribing drugs by

generic name, calculated by dividing the number of drugs prescribed by generic name with total number of drugs prescribed, multiplied by 100; frequency of administration of veterinary drugs, calculated by dividing the number of patient encounters in which drug was prescribed with the total number of encounters surveyed, multiplied by 100; practices of standard veterinary treatment guideline, calculated by dividing number of products prescribed which are in veterinary drug list with the total number of drugs prescribed, multiplied by 100; Percentage of drugs prescribed from national veterinary drug list of Ethiopia (EVDL) was calculated by dividing number of products prescribed which are in veterinary drug list with the total number of drugs prescribed multiplied by 100; rational use of veterinary drugs means the sick animals receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period, and at the lowest cost to them and their community (DACA, 2002; Beyene *et al.*, 2015).

RESULTS AND DISCUSSION

A total of 1,500 patients' profiles from casebook were assessed at Modjo veterinary clinic. Retrospective study has shown that a total of 1660 drug products were prescribed, and the average number of drugs per prescription was 1.11 with maximum of three drugs. The total number of drugs prescribed by generic name was 1524 (91.8%) and the remaining 136 (8.19%) treatment was prescribed with drugs in their brand name and drugs were prescribed by EVDL with a percentage of 97.2%.

As indicated in table 1, out of the total 1660 drugs prescribed, 1003 (60.41%) antimicrobials 585 (35.24%) anthelmintics and 72 (4.34%) other drugs were prescribed. The most commonly prescribed antimicrobials were oxytetracycline 864 (52.04%), penstrep 136 (8.19%), anthelmintics were ivermectine 560 (33.7%) and albendazole 17 (1.02%). The rational drug use evaluation has shown that antimicrobials, anthelmintics, antimicrobial with anthelmintic combinations, antimicrobial with other drugs combinations, and anthelmintic with other drugs combinations were prescribed (Table 1).

Among 1,500 prescription admitted to the Modjo veterinary clinic to get treatment, 98.2% were treated empirically, without getting correct definitive (laboratory supported) diagnosis though some were diagnosed based

on pathognomonic and specific clinical signs rather than confirmatory laboratory tests. The routes of drug administration were not written for 91% of the prescribed drugs.

Table 1: Commonly prescribed drugs in Modjo veterinary clinic from 2012 to 2017

Therapeutic agent	Frequency	Percentage
Antimicrobials		
Oxytetracycline	864	52.04%
Penstrep	136	8.19%
Sulfadimidine	3	0.18%
Sub total	1003	60.41%
Anthelmintics		
Ivermectine	560	33.7%
Albendazole	17	1.02%
Fenbendazole	8	0.48%
Sub total	585	35.24%
Other drugs		
Magnesium hydroxide	29	1.57%
Iodine tincture	9	0.54%
Fursamide	7	0.42%
Multivitamine	26	1.56%
Mineral oil	1	0.06%
Sub total	72	4.34%
Total	1660	100%

Additionally, there were no any record about the history of pretreatment, standard prescription paper and standard treatment guidelines and only few essential drugs were available at Modjo veterinary clinic although the duration of administration of these drugs were also not specified for 96.8% of the cases. The current study also showed number of drugs per encounter with antimicrobials, anthelmintic, other drugs, antimicrobial with anthelmintic combinations, antimicrobial with other drugs combinations, and anthelmintic with other drugs combinations were prescribed for 1,500 patients admitted to modjo veterinary clinic (Table 2).

The association between drug administered and disease diagnosed was also assessed to see the rational prescription pattern. The study result showed 28.7%, and 3.8%-anthelmintics were irrationally administered for bacterial and viral disease respectively.

Table 2: Prescribing indicators at Modjo veterinary clinic from 2012 to 2017

Prescribing indicator	Total	Average/percent
Number of drugs per encounter	1660	1.11
Encounters with antimicrobials	1003	60.41%
Encounters with anthelmintics	585	35.25%
Encounters with antimicrobials-anthelmintics combination	106	7%
Encounters with others	72	4.34%
Encounters with antimicrobials-others combination	27	1.8%
Encounters with anthelmintic-others combination	27	1.8%
Drug prescription by generic name	1524	91.8%
Drug prescription from EVDL	1613	97.2%

EVDL (National veterinary drug list of Ethiopia).

In addition antimicrobials used irrationally for parasitic disease with a percentage of 8.6% and for viral disease with a percentage of 26.2 % was prescribed for parasitic diseases with a (p value = 0.000) (Table 3).

In this study, the average number of drugs per prescription at Modjo veterinary clinic was 1.11. This finding is in accordance with the study conducted by Beyene *et al.* (2015) at veterinary teaching hospital of the college of veterinary medicine and agriculture (VTHC-VMA) and Ada District veterinary clinic, who reported 1.23. However, the prescribing indicator for human average number of drugs prescribed per encounter is (optimal value 1.6–1.8) (WHO, 1993). The current study is lower than the admissible range of drugs per encounter that shows polypharmacy was not found to be a problem. A study done on drug use indicators of humans in selected public hospitals of eastern Ethiopia also showed the average number of drugs prescribed per encounter was 2.34 (Limat, 2007). A national baseline study done on drug use indicators of humans in Ethiopia in September 2002 showed the average number of drugs prescribed per encounter to be 1.9 EPA (2003), which is above the current study. Besides the studies conducted in Afghanistan (3.9) and India (5.6) Akahitar *et al.* (2012) reported a relatively higher number of drugs per prescription which might be related to lack of adequate knowledge and training of health professionals, variation in the health care delivery

Table 3

Drug	Disease							Total
	Viral	Bacterial	Parasitic	Surgical	Metabolic	Fungal	Mixed	
Antimicrobial	226(26.2%)	676(67.4%)	86(8.6%)	2(0.2%)	9(0.9%)	0(0.0%)	4(0.45)	1003
Anthelmintic	22(3.8%)	168(28.7%)	349(59.7%)	0(0.0%)	41(7.0%)	0(0.0%)	5(0.9%)	585
Others	2(2.8%)	30(41.7%)	3(4.2%)	4(5.6%)	28(38.9%)	4(5.6%)	1(1.4%)	72
Antimicrobi + Anthelmintic	11(10.7%)	36(34.0%)	49(46.2%)	0(0.0%)	6(5.7%)	0(0.0%)	4(3.8%)	106
Other + Antimicrobial	1(3.7%)	24(88.9%)	1(3.7%)	0(0.0%)	1(3.7%)	0(0.0%)	0(0.0%)	27
Other + Anthelmintic	0(0.0%)	4(14.8%)	1(3.7%)	0(0.0%)	21(77.8%)	0(0.0%)	1(3.7%)	27

$\chi^2 = 2553.92$, P-value = 0.000.

system, empirical prescribing and symptomatic treatment approaches attributed to multiple reasons. The low values mean there is constraint in the availability of drug, or prescribers have appropriate training in therapeutics (Anteneh, 2013). However, the low values in Modjo veterinary clinics might mean there is constraint in the availability of drug rather than beliefs of prescribers have appropriate training in prescription of drug.

The total number of drugs prescribed by generic name in the present study was at a level of 1524 (91.8 %). A national baseline study on drug use indicators in Ethiopia in September 2002 also showed the percentage of drugs prescribed by generic name for human subjects was 87% (EPA, 2003), which is lower than the current finding of 91.8 %. The study conducted in public hospitals in Gamo Gofa Zone, Southern Ethiopia September, 2013, the Percentage of drugs prescribed by generic name and from an essential drug list was 100% (Kassahun, 2016).

The result of this study was lower than the ideal WHO standard (100%) (Isah *et al.*, 2004). Brand prescribing is associated with unnecessary treatment costs, difficulty of remembering the medication, accessibility and bioequivalence problems (WHO, 1993). Therefore, more effort is to be invested to effectively avoid the problems of brand prescribing and to promote safe, cost effective and accessible generic drugs. Out of the total 1660 drugs prescribed, 1003 (60.41%) antimicrobials 585(35.24%) anthelmintics and other drug 72(4.34%) were prescribed. The most commonly prescribed antimicrobial was oxytetracycline 864(52.04%), anthelminticsit was ivermectine 560(33.7%). The current result in line with the study conducted by Beyene *et al.* (2015) revealed 54.4% antimicrobials, 38.9% anthelmintic and 6.7%

others drugs were prescribed at VTH-CVMA and Ada District veterinary clinic, where the commonly used anthelmintics was albendazole (32.8%). There is no any report that supports the ideal standard percentage of encounters in which antibiotics were prescribed for animals. However, the ideal standard percentage of drug encounters in which antibiotics are prescribed for human is 20.0-26.8% (WHO, 1993; Isah *et al.*, 2004). This finding suggests that the antibiotics are over prescribed. The high percentage of antibiotics prescribed in this study might be due to inadequate recognition of the disease, unavailability of diagnostic aids for confirmatory test, absence of right drug, prescribers belief of the therapeutic efficacy of the antibiotics is reduced and knowledge of prescribers. Inappropriate and over use of antibiotics, as observed in this study might result in the emergence of antimicrobial resistance which is one of the major obstacles of chemotherapy for our globe. If irrational use of antimicrobial agents is continued in this manner, the available antimicrobial agent might be useless in the near future. This is due to the imbalance between alarming rate of antimicrobial resistance and decelerating rate of new antimicrobial drug development (WHO, 1993). Moreover, the cost incurred is high due to extravagant prescribing where drugs are prescribed for viral infection or for infections in which symptomatic treatment is enough. In addition, empirical treatment was also a problem, where two or more drugs prescribed but one specific antibiotic is enough after proper diagnosis. Ivermectine and albendazole, which are used for the treatment of parasitic diseases, are also commonly available and utilized at Modjo veterinary clinic. As a result, over use of these drugs might favor development of anthelmintic resistance in the study area. Overuse of this anthelmintic might be

due to the scarcity of other anthelmintic drugs in Modjo veterinary clinic.

The current study showed that high percentage of anthelmintics was prescribed irrationally for bacterial disease with a percentage of 28.7%, metabolic disease with a percentage of 7% and 3.8% for viral disease. This study is in line with the findings of Kassahun *et al.* (2016) who reported 44.3% of anthelmintics were prescribed irrationally to treat diseases that were tentatively diagnosed as non parasitic disease in Gondar university Veterinary clinics. In addition the study finding indicated that antimicrobials drugs also irrational used for viral diseases (26.2%) as a prevention of secondary complication, for parasitic disease (8.6 %), for surgery (0.2%) and metabolic disease (0.9%). This finding agrees with the study conducted by Gyssens who reported 40–60% of antibiotics prescribed inappropriately (Rehan *et al.*, 2001). Irrational use of anthelmintics and antimicrobial drugs in modjo veterinary clinic might be due to inadequate knowledge on the impact of misuse of drug, inavailability of viral drugs aswell as fungal drugs and inavailability of clean and aseptic room for sugery.

Drugs are the most frequently detected chemical residues in foods of animal origin, overwhelmingly majority of which are antimicrobials Geary *et al.* (2010) commonly used in veterinary practice. Drug residues in animal-derived food products are an important consideration for consumers as it may favors the emergence of resistant microbial strains within a host as well as by being of allergic, toxic, mutagenic, teratogenic, or carcinogenic (Dowling, 2013).

The educational level and work experience of the prescribers were also assessed. 1019 (67.9%) and 481 (32.06%) of the prescriptions were done by animal health assistants and veterinarians, respectively. This study was similar with the study conducted by Beyene *et al.* (2015) at VTH-CVMA and Ada District veterinary clinic, where 70.8% and 29.2% of the prescriptions were done by animal health assistants and veterinarians, respectively. The finding of the study indicated that the educational background of veterinary drug prescribers is low and needs attention so as to avoid therapeutic failure and delay drug resistance development. The Ethiopian federal constitution under proclamation no 728-2011 stated that veterinary drugs shall only be prescribed by a veterinarian.

It also stated that a veterinarian shall prescribe veterinary drugs following prescription procedures and on standard prescription paper (WHO, 1993). Besides, the most important educational material for prescribers is the standard treatment guideline (STG), which is essential particularly most effective among untrained health workers. However, this educational material was not available for professionals in the study area(FNG, 2012). Hence, relevant guidelines and other drug information sources must be present in hand of every veterinary professional for prudent use of chemotherapeutic agents and to success of voluntary measures take to minimize drug resistance (Kafuko *et al.*,1994).

Regarding route of administration of drugs about 96.5% of the case not specifying the routes of drug administration, it reveals irrational drug use. This might be due to lack of attention by the professionals to write on the case paper.

CONCLUSION

The finding of the present study on rational use of veterinary drug has shown that there were problems in generic prescribing, lack of laboratory test, low prescribers educational status, lack of standard veterinary treatment guideline, misuse of drugs, overuse of drugs and absence of essential drugs, could lead to irrational drug use. Hence, improvement should be made on availability of key essential drugs on stock through good drug supply management to reduce misuse of drugs, overuse of drugs and therapeutic failure.

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