SUDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY

College of Graduate Studies

SOCIOECONOMIC IMPACT OF USING CHEMICALS IN THE FOOD PRODUCTION CHAIN OF ANIMAL ORIGIN

التأثير الاجتماعي الاقتصادي لاستخدام المواد الكيميائية في سلسلة إنتاج الغذاء ذات الأصل الحيواني

A thesis Submitted to the College of Graduate Studies in Fulfilment of the Requirement for the Degree of the Master in Food Safety

BY

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Dedication

To My

Lovely

Parents

Family

&

Brother and Sisters

And Inspiration in Previous Studies

As well as for this work

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Before all others a lot thanks be to the God for giving me the patient and ability to conduct this research.

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ABSTRACT

Residues in food have received much attention in recent years because of growing food safety, public health concerns and the levels of pesticide residues are now over alarming situation in certain countries, so consumers are becoming more worried about this. The presence of residues in food of animal origin constitutes socioeconomic challenges in international trade in animal and animal products.

The aim of this review was to focus on food safety in relation to veterinary drug residues and pesticide residues in animals product (meat and milk).It was represents a review of information collected from farmers, veterinarians and other related job in relation to veterinary drug and pesticide residues in livestock and livestock products in Sudan. Data were collected by using face to face interview structured questionnaire comprise of knowledge of veterinary drugs and pesticides residues. The questionnaire revealed that there was a general lack of awareness among food animal producer on the correct way of using veterinary drugs (40%),withdrawal period (98%),while (19%) obtain drugs without prescription and,(6%) are using growth promoter however, the data showed that (90%) of veterinarian do not calculate the dosing on body weight basis which might lead to over-dosing or sub-dosing, also there was lack of follow up of cases after leaving the clinic (60%).The wide spread of the misuse drug ,improper drug dispensing and handling practices can affect the drug potency and can also contribute to the veterinary drugs residues in the Sudanese food animals and their products.

Veterinarians must be well aware of the importance of chemical residues in the food animals and their possible risk to the general public, and updated the information about the proper withdrawal times of all the chemicals used in their areas of practice. They must extend this information to the livestock farmers for the production of residue free edible animal products (milk, meat), for residue

analysis, trained manpower are needed. The responsibility for residue control and prevention must be shared by the government, producers, veterinarians, teachers and academicians, marketing associations, and other interested parties, who must strive for both healthy and efficiently grown animals as well as a safe food supply Several approaches can be taken to achieve this goal.

المستخلص

التأثير الاجتماعي الاقتصادي لاستخدام المواد الكيميائية في سلسلة إنتاج الغذاء ذات الأصل الحيواني

المخلفات الكيميائية حظيت باهتمام كبير في السنوات الأخيرة بسبب تزايد الاهتمام بسلامة الغذاء وآثارها علي الصحة العامة ، لذلك أصبح المستهلكون أكثر قلقا و يشكل وجودها في الغذاء من أصل حيواني تحديات اجتماعية واقتصادية في التجارة الدولية في المنتجات الحيوانية.

كان الهدف من هذه المراجعة التركيز على سلامة الغذاء فيما يتعلق بمخلفات الأدوية البيطرية ومبيدات الآفات في المنتجات الحيوانيه (اللحوم والحليب) وشملت مراجعة للمعلومات التي تم جمعها من المربين والأطباء البيطريين وغيرها من الوظائف ذات الصلة فيما يتعلق بمخلفات الادويه البيطرية ومخلفات مبيدات الآفات في الماشية ومنتجاتها في السودان. تم جمعها باستخدام الاستبيان و تبين أن (40 ٪) من مربي الحيوانات عدم معرفتهم بالطريقة الصحيحة لاستخدام الأدوية البيطرية و المبيدات وبفترة الانسحاب(98 ٪) بينما يحصل (19٪) على أدوية بدون وصفة طبية (6 ٪) يستخدمون محفزات النمو. كما أظهر الاستبيان أن (90٪) من الأطباء البيطريين لا يحسب حجم الجرعات الدواء على أساس وزن الحيوان مما قد يؤدي إلى الإفراط في الجرعات و عدم متابعة حالة الحيوان بعد مغادرة العيادة (60٪) .

الاستخدام الخاطئ والتوزيع غير السليم للأدوية يؤثرعلى فاعلية الدواء ويمكن أن يساهم أيضًا في مخلفات الأدوية البيطرية في حيوانات الغذاء ومنتجاتها.

علي الأطباء البيطريون الدراية التامة بأهمية المخلفات الكيميائية في الحيوانات الغذائية ومخاطرها المحتملة للمستهلك و تحديث المعلومات حول الأوقات المناسبة لفتره سحب جميع المواد الكيميائية

المستخدمة في مجالات عملهم وارشاد مربي الماشية لإنتاج منتجات حيوانية صالحة للأكل خالية من المخلفات (الحليب واللحوم) .

وتقاسم الحكومة والمنتجون والأطباء البيطريون والمعلمون والأكاديميون وجمعيات التسويق ، والأطراف المهتمة الأخرى مسؤولية التحكم في المخلفات والوقاية منها ، و أن يسعوا جاهدين من أجل توفير الغذاء الآمن.

INTRODUCTION

Sudan is a vast country of great animal wealth and diversified climatic conditions it considered amongst those countries having a great agricultural potential. (Daskiran. *et al.*, 2006). The livestock sector plays a critical role in the Sudanese economy and in the welfare of the whole population. It provides a flow of' essential food product, brings in a large amount of foreign exchange from export earnings, is a major means of transport, produces draught power in support of crop production and processing, provides dung for fertilizer and fuel and creates employment. For all these reasons and especially from the equity and livelihood perspective it is an important, indeed major, component of poverty alleviation (Wilson, 2018). Sudanese livestock products meet the domestic demand for meat in addition to a substantial excess for export amounting to about 22% of total country exports. It contributes about 20% of GDP (MOAR, 2018) and is self-sufficient in red meat, but is short in fresh milk supplies (MOAR, 2015). Sudan pastoral system is characterized by low input and low technology. It supports the largest number of animals in the Sudan and utilizes vast area of rangeland (110 million ha) (MOAR, 2015).The export orientation of the pastoral livestock system of production in Sudan is very strong. All of Sudan live cattle and live camel exports and sizable portion of locally consumed beef originates from the pastoral system of production (MOAR, 2015).Overgrazing is widespread constraint to the sustainable development in the Pastoral system requiring inputs to improve animal husbandry, livestock off take and the integration of grazing control with water development (MOAR, 2015). Livestock production is being focused as a source of livelihood and income generation for herders, in 2018 the livestock population in Sudan was estimated the around 108 Million (MOAR, 2018).

The problem of satisfying the dietary requirement of a growing population is becoming increasingly acute, drugs that improve the rate of weight gain, improve

feed efficiency, or prevent and treat diseases in food-producing animals are critically needed to meet the challenge of providing adequate amount of food for that population ,this benefit to improve producing from the use of animal drugs in food-producing species is not obtained without risk, the risk associated with drug residues that remain in the tissues of treated animals, if animal drugs were not absorbed or were metabolized to harmless products, there would be no concern , therefore necessary to collect data on residues and their safety (Crawford,1985). The presence of the residues may be due to failure to observe the withdrawal period of the drug, over dosage or the use of an unlicensed drug (Paige, 1994). However, these residues may cause numerous public concern in human, these problems may include the transfer of veterinary drugs resistant to humans, mutagenicity allergy and carcinogenicity (Nisha, 2008).In the Sudan, a great deal of concern has been demonstrated over the last decades about the presence of chemical residues, mainly veterinary drugs and pesticides, in the food of animal origin, Also accidental exposure to chemicals in the environment can also result in tissue residues (Seri, 2013) .However scarce data information are lacked therefore this study questionnaire was designed to provide realistic data of the using veterinary drugs and pesticides and their consequence to public health and trade, So veterinarians and farmers should be aware, to follow the withdrawal period and misuse of veterinary drugs, and finally using the law and legalization to avoid the side effect on livestock and human.

Objectives of the Study

1. To review and qualify chemical residues (Veterinary Drug and Pesticides residues) in livestock products in Sudan and Compare it with standards limits.
2. Correlate the magnitude of hazards of chemicals used in the production chain of food of animal origin to public health.
3. Assessment of the effect of the residues on socioeconomical impact on production chain.

CHAPTER ONE

LITERATURE REVIEW

1.1. Chemicals Residues

Residues in the widest sense may be defined as undesirable substances present in food meat and milk, these substances are chemical or biological in nature and have always been present in a small amount or can be introduced into the environment by various technological practices, can arise as a result of incorrect storage of foodstuff, can get into the food chain due to modern agricultural practices and thus introduced into the foods or they may be results of medicines given to the animals or of processing methods . (Biswas. *et al*., 2010). Surveillance/monitoring on the occurrence of residues in animal products was relatively a neglected area until the last decade. However, the advancement of technological intervention regarding livestock rearing, disease control, and intensive crop production system, the chances of residues in foods of animal origin increased tremendously, this results from a potential risk of various life- threatening diseases such as cancer, leukemia, reproductive disorder besides disruption of the body's immune, endocrine and nervous system (Horrigan. *et al*., 2002). The growing awareness of public perception about this reduces the confidence among the consumers and resultant adverse impact on the global economy. Ideally, meat food should be completely free from such types of contaminants. This is a utopian goal considering current agricultural and technological practices. Many developed countries in the world have already been tracking this problem by fixing statutory limitations of pesticides, veterinary drug residues and microbial toxins in meat and meat products and their enforcement through monitoring to ensure safe food supply to consumers. Monitoring of such types residues in foods of animal origin can reveal the current status of contamination, thus enabling preventive and control measures to be initiated before contamination becomes so serious or widespread that threatens human health or causes serious economic losses (Biswas. *et al* ., 2010).

1.2. Veterinary Drugs and Animals Diseases

Diseases lower the production of animals and could lead to death. In addition, there is always the risk of humans being exposed to diseases carried by animals. Overall health performance of Sudanese livestock is unsatisfactory because of shortages in veterinary services and stock feed supply coupled with the adoption of poor livestock management practices. Animal health authorities are primarily concerned with major infectious diseases that are of potential economic importance because they lower total output and interdict export of livestock ,some diseases constitute a human health hazard under migratory pastoral production long treks on hoof, seasonal limitation of feed intake, intermingling of different group and overstocking provide ideal opportunities for the extensive spread of infectious diseases such as Rinder Pest , Foot &Mouth disease (FMD) and Contagious Bovine Plueropnumonia (CBPP) . Tick born disease under mixed agriculture, poor hygiene and inability to supply proper feed leads to wide variety of parasitism and infections that debilitate the animal and reduces the number of calves that could be fattened for meat production or raised as replacement heifers, Shistozomiasis is a parasitic disease of ruminants that is widely spread in irrigated areas. With intensive meat production system many health problems of the pastoral system will be accentuated because of higher stocking density. Epidemic diseases, brucellosis and tuberculosis are certain to increase unless appropriate preventive measures are adopted. Gastrointestinal parasites increase as the stock has less grazing area per animal. In dairy cattle production the most common diseases are mastitis, brucellosis and metabolic diseases. (MOAR, 2015).

Modern farming practices involve administration of a wide range of veterinary drugs and biological substances to food- producing animals with the primary aim to combat diseases and promote growth. However, prophylactic administration of these drugs, particularly antibiotics, via drinking water or as feed additives, is also a routine farming practice in order to prevent possible disease outbreaks (Stolker, *et al*., 2007).

Additionally, certain drugs are also administered to prevent losses and stress during transportation, the Ever-increasing demand for proteins and related food products in the wake of population burst has led to intensive farming practices, which in turn have caused an enormous increase in the use of veterinary drugs over the past two decades. While routine administration of broad- spectrum antibiotics has helped to curtail many of the infectious diseases. But the inappropriate and over use of veterinary drugs has generated great public concerns, as drug residues present in foodstuff of animal origin, may jeopardize human health (Granelli and Branzell, 2007).

1.2.1. Veterinary Drug Residues

Veterinary drug residues are a key concern in food safety and consumer protection, more so for the lesser developed countries, which either lack a comprehensive regulatory framework or in other cases fail to implement the same. In addition to being a serious threat to consumer health as well as the environment, veterinary drug residues may have a profound impact on international trade (Boutrif, 2003). It has been noted that different residue levels can be found in different tissue positions such as site and route of The residual amount ingested is in small amounts and not necessarily toxic also failure to maintain treatment records or using prohibited drugs for economic animal treatment (Tufa, 2016) However, there is limited information on the magnitude of veterinary drug residue worldwide.

1.2.2. Types of Veterinary Drugs

1.2.2.1. Over-The Counter Drugs (OTC) can be sold by any person or establishment without the prescription of a veterinarian.

1.2.2.2. Prescription Drugs (Rx) can only be sold to the farmer by a veterinarian or pharmacist, and only with the prescription of a veterinarian.

1.2.2.3. Veterinary Feed Directive VFD is a drug intended for use in or on feed, which is limited by an approved application to use under the professional supervision of a licensed veterinarian. Pulmotil (Tilmicosin) is the first VFD

product approved for use in cattle. The Food and Drug Administration (FDA) approved the drug as a treatment for groups of cattle in the early stages of bovine respiratory disease outbreak to provide 14 days of sustained in-feed therapy. Pulmotil is approved for use in beef and non-lactating dairy cattle. (Producer Manual of Best Management Practices, 2014).

1.2.2.4. Withdrawal Period

The withdrawal time (also known as the depletion or clearance period) is the time for the residue of toxicological concern to reach a safe concentration as defined by the tolerance. Depending on the drug product, dosage form, and route of administration, the withdrawal time may vary from a few hours to several days or weeks. It is the interval necessary between the last administration to the animals of the drug under normal condition of used and the time when treated animal can be slaughtered for the production of safe foodstuffs (Kaneene and Miller, 1997).

1.2.3. Safety Evaluation for Veterinary Drug Residue

1.2.3.1. Extra-label drug use (ELU)

It refers to the use of approved drug in a manner that is not in accordance with the approved label directions. ELU occurs when a drug only approved for human use is used in Animal, when a drug approved for one species of animal is used in anthor, when a drug is used to treat a condition for which it was not approved, or the use of drug at levels in excess of recommended dosages (Boothe, *et al*., 2012).

1.2.3.2. Maximum Residue Limit

A Codex Maximum Limit for Residues of Veterinary Drugs (MRL) is the maximum concentration or residue that results from the use of a veterinary drug (expressed in mg/kg or g/kg on a fresh weight basis) recommended by the Codex Alimentarius Commission to be legally permitted or recognised as acceptable in or on a food. An MRL is based on the type and amount of residue considered to be without any toxicological hazard from human health as expressed by the Acceptable Daily Intake (ADI), or on the basis of a temporary ADI that utilises an

additional safety factor. An MRL also considers public health risks as well as food technology issues.

1.2.3.3. Acceptable daily intake (ADI)

Is the amount of substance that can be ingested daily over a life time without appreciable health risk The ADI calculation is based on the array of toxicological safety evaluation that takes in to account acute and long term exposure to the drug and its potential impact. This defines a maximum quantity that may be consumed daily by even the most sensitive group in the population with any out ward effects (Bayou and Haile, 2017). an estimate by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) of the amount of a veterinary drug, expressed on a body weight basis, that can be ingested daily over a lifetime without appreciable health risk (standard man – 60kg).When establishing a MRL, residues that occur in food of plant origin and/or the environment are also considered. Furthermore, MRL may be reduced to be consistent with good practices in the use of veterinary drugs to the extent that practical and analytical methods are available.

1.2.4. Hazards of drug residues

Potentially, there are two types of hazards relating to drug residues

(a) Direct and short term hazards that Drug**s** used in food animals can affect the public health because of their secretion in edible animal tissues in trace amounts usually called residues (Salehzadeh. *et al*., 2006) Some drugs have the potential to produce toxic reactions in consumers directly , Other types of drugs are able to produce allergic or hypersensitivity reactions.

(b) Indirect and long term hazards that include microbiological effects, carcinogenicity, reproductive effects and teratogenicity. Microbiological effects are one of the major health hazards in human beings. Antibiotic residues consumed along with edible tissues like milk, meat and eggs can produce resistance in bacterial populations in the consumers. This is one of the major reasons for therapeutic failures amongst such peoples. (Muhammad.*et al*., 2009).

1.3. Hazard of Adulteration in Sudan

In Sudan, milk is distributed through irregular marketing channels such as venders on donkeys or by cars in addition to collection centers and some consumers buy milk directly from the farms, their informal channels make milk uncontrollable and could influence the nutritional value of milk in case of adulteration (Mohammed and Shuming, 2017) which it was defined in 2009 by the Food and Drug Administration (FDA) as the fraudulent, intentional substitution or addition of a substance in a product for the purpose of increasing the apparent value of the product or reducing the cost of its production," and can often encompass effects public safety through the unknown addition of allergens, toxins, and hygienic risks (Wheatley and Spink, 2013) .

Now-a-days it is very common to hear or read news about the food items being adulterated and such products are being openly sold out and are consumed by people, which cause various health hazards .Adulteration of milk and other dairy products has existed from old times. That is why it was necessary to stipulate regulatory standards against adulteration in food and develop methods or tests to detect adulteration particularly adulteration of milk with cheaper and sometimes toxic chemicals is matter of serious concern Milk is adulterated either intentionally or accidentally during production and processing of milk (Harding. *et al,*1995) .Stated that there are many potential adulterants in liquid milk, such as neutralizers, salt, sugar, water, or solid contents Normally the adulteration is done either for financial gain or lack of proper hygienic conditions of processing, storage, transportation and marketing. This ultimately leads to stage that the consumer is either cheated or often becomes victim of diseases. Adulteration is very common in developing countries. It is evenly important for the consumer to know the common adulterants and their effects One of the oldest and simplest forms of milk adulteration is through the addition of variable volumes of water to increase its volume for greater profit; this can substantially decrease the nutritional value of milk, and if the water added is contaminated there is a high

risk to human health because of potential waterborne diseases (Kandpal.*et al*., 2012).

Sellers adulterate milk with water because it is cheap rather than starch which may be homogenized and obviously can be detected and discovered by the consumer (Adam, 2009).In raw milk, chemical like formalin, hydrogen peroxide, boric acid and antibiotics are added to increase the shelf life (Kandpa. *et al*.,2012) The other kind of adulteration of milk by the additions of starch, rice flour, skim milk powder, reconstituted milk, urea, melamine, salt, glucose, vegetable oil, animal fat and whey powder. These additions is to increase the thickness and viscosity of the milk, and to maintain the composition of fat, carbohydrate and protein (Singuluri .H, Sukumaran .MK, 2014).

Some kinds of the adulteration, their impact on the health of human body are discussed in the following sections in Water is the most common adulterant in milk (Barham. *et al.*, 2014). The major percentage of natural milk contains water (87%), but milk with added water is a serious concern.

In one hand it decreases the nutritious value; on the other hand chemicals are added to compensate the density and colour after dilution with water. Since addition of water is the easiest way and cheap source for adulteration of milk. Also with Urea is common milk adulterant to increase the shelf life is addition of urea to milk (Trivedi. *et al*, 2009). Urea is also used to prepare synthetic milk and increase the SNF value.

The average content of urea in cow milk is about 50 mg/100 ml (average). Urea content in milk may also increase due to unbalanced feeding of cows, (Singh, *et al*, 2008) .It is also used for heat stability (Ramakrishnaiah and Bhat, 1986).

1.4. Pesticides Residues

Pesticides a unique status of all food residues because these compounds are regularly used in agricultural fields to meet worldwide food demands. It is estimated that, without pesticides, world production of food would be reduced by 30 % (Biswas **.***et al.***, 2010).** Also it has been estimated that about three million cases of pesticide poisoning occur worldwide each year, with 220,000 deaths

(UNE, 2004). The Majority of these poisonings occur in developing countries due to less protection against exposure, ignorance from health risk and easy access to harmful chemicals (Muhammad.*et al*., 2009). Pesticides have contributed to a dramatic increase in crop yields and in the quantity and variety of the diet. Also, they have helped to limit the spread of certain diseases. But pesticides also have harmful effects; they can cause injury to human health as well as to the environment. The range of these adverse health effects includes acute and persistent injury to the nervous system, lung damage, injury to the reproductive organs, and dysfunctioning of the immune and endocrine systems, birth defects, and cancer. Problems associated with pesticide hazards to man and the environment are not confined to the developing countries. Developed nations have already suffered these problems, and are still facing some problems in certain locations. For many reasons, the severity of pesticide hazards is much pronounced in third world countries. (Muhammad.*et al*., 2009).

Ultimately, both routes (plants and animals) lead to the bioaccumulation of pesticides in animal products like milk, meat, fat, and eggs. A wide range of milk and milk products are polluted from grass, corn, silage and through pesticides direct application on cattle, these chemicals accumulate in the cattle milk. As humans beings are on the top of tropic level or in the food chain, they are bigger consumers of pesticides. These pesticides cause a wide range of toxic effects and pose very severe health risks, specifically in infants, who have less developed metabolic and enzymatic systems overall health effects on humans by pesticides are not well defined but evidence are increasing for nontoxicity, carcinogenicity and hormonal disturbance (Akhtar and Karam, 2017).

1.4.1. Prevention and Control of Pesticide Residues

Maximum residue levels (MRLs) have been set by the European Union and Codex Alimentarius to ensure that pesticides are present below the unacceptable risk limit. These MRLs are the upper legal limits of pesticide concentrations in feed and food. MRLs are established for a wide variety of plants and animal's origin based food commodities. MRLs are not simply set as threshold levels of

toxicologically but they are derived after a broad assessment of the active substance properties and their residue behaviour on treated crops there was a need to investigate the pesticides residues in milk in order to provide a baseline to a health department or governing bodies to make safety regulations. Additionally to pesticides residues monitoring program is very essential for the safety of consumer health and to achieve food safety in country (LeDoux and Chromatog, 2011) **.**In contrast to pesticides, residues of veterinary medicinal products are most common in foods of animal origin as they are directly exposed to the animals. But this could be avoided if used properly with sufficient withdrawal period of times. Drug residues in meat occur when these are used via parental or oral route or as feed additives in food animals. The range of veterinary medicinal products used in regular animal husbandry practices is extremely wide, ranging from teat dips to hormones (Biswas. *et al*., 2010).

1.5. Food Safety and Chemicals Residues

Food safety is a term broadly applied to food quality that may adversely affect human health. These include zoonotic diseases and acute and chronic effects of ingesting natural and human-made Xenobiotics (Lee. *et al*., 2001).

There are two major areas of concern over the presence of residues of drugs in animal-derived foodstuffs with regard to human health. The first is allergic reactions. Some antibiotics, such as penicillin can evoke allergic reactions even though small amounts of them are ingested or exposed by parenteral routes. The second is development of drugs resistance in gut bacteria of human (Lee. *et al*., 2001)**.** Now a serious therapeutic problem in human. Although it is evident that drugs are required in the efficient production of meat, milk and eggs, their indiscriminate use should never be substituted for hygienic management of farm. Drug should be used only when they are required. In addition to veterinary drugs, environmental contaminants that were contaminated in feed, water and air can make residues in animal products. Mycotoxins, heavy metals, pesticides, herbicides and other chemicals derived from industries can be harmful both to

animal and human health (Lee.*et al*., 2001). Recently HACCP has been introduced to promote food safety from farm to table by reducing hazardous biological, chemical and physical factors. Animal Production Food Safety Program, Quality Assurance Programs, Food Animal Residue Avoidance Databank are para- or non-governmental activities ensuring food safety (Lee.*et al*., 2001)**.** The importance of food safety knowledge has increased with the increase in food borne illness and the emergence of new pathogens (Haapala and Probart, 2004)**.** Thus, Knowledge and awareness are essential in reducing food borne outbreaks and illnesses that continue to occur among all consumers (Kendall. *et al*., 2003).

1.5.1. HACCP (Hazard Analysis and Critical Control Point)

HACCP is a system that would provide a degree of certainly that food was free from pathogen and toxins (Crosland, 1997).the HACCP system principles make up the Codex standard which has become the reference for international food safety and identified as the baseline for consumer protection under the agreement of Sanitary and Phytosanitary measures agreed at the General on Tariffs and Trade (GATT) negotiation in effective food1995 (Slatter, 2003). HACCAP has a proven track record for identifying and preventing contamination and combines common sense with science to ensure safer food Production .It is very complementary to total Quality Management (TQM) and quality assurance (Herrera, 2004).

As an increasing amount of food products are traded internationally, standards such as ISO 22000 is to provide one internationally recognized standard for a food safety management system that can be applied to any organization in the food chain. The food safety management system should cover organization and technical issue address the needs of the consumer and based on the concept of continuous assessment and participation of all employees working (Jouve, 2000).

1.6. Chemicals Residues and Health Risk

The human health consequences of chemical residues in animals is a subject which is hotly debated, between farmers, chains of food suppliers, pharmaceutical companies, drug regulators, public health administrators, and consumer groups (Fingleton,2004) .

There are health problems associated with chemicals residues animal originated foodstuffs could pose consumer's health risk. Chemicals residues in food are potential threat to direct toxicity in human and their low levels would result in death, cause disease and the possible development of resistant strains which cause the failure of drugs therapy in clinical situations. However, the principal hazardous effect is likely to develop the resistance of bacteria following the ingestion of sub-therapeutic doses of antimicrobials.

The resistance could be transferred from non-pathogenic microorganisms to pathogenic ones, which would then no longer respond to normal drug treatment (Heshmati.A.,2015) .Other harmful effects related to drugs residues in food include immune pathological effects, autoimmunity, carcinogenicity (sulphamethazine, oxytetracycline, furazolidone), mutagenicity, nephropathy (gentamicin), hepatotoxicity, reproductive disorders, bone marrow toxicity (chloramphenicol), and allergy (penicillin) (Heshmati. *et al*., 2013) (Nisha., 2008). Allergic reactions may also be produced in sensitive or sensitized individuals. For protecting humans from exposure to any veterinary residues, a withdrawal time has been determined.

Veterinary drug residue contents in animal-originated food depend on various factors such as drug dosage, type and age of animal, feeding, disease status, poor management, extra-label drug use, withdrawal time, and route of administration (Kaneene and Miller, 1997). Among all residues, pesticides receiving most interst worldwide in recent years. Thought violative level of pesticides are relatively uncommon, a low violation rate even remain an important public health consideration because of their wide spread use in meat and poultry production, their persistence in environment and varying toxicity.

The United Nation has estimated that about million poisoning and 10,000 death occur each year from pesticides, the acute and malicious consumption involving higher dose results in death whereas, chronic insidious intake lead to elevated cancer risk and disruption of body's, reproductive, immune endocrine and nervous system (Horrigan. *et al*., 2002) .In contrast to pesticides, exposure from veterinary drug residues rather most common as are directly injected or fed to the animals. The over use of antimicrobials such as tetracycline, sulphonamides in animal production or their residues in food system pose potential allergic reactions in sensitized individuals ,but sub therapeutic and therapeutic levels may perturb human gut micro flora (Paige. *et al* .,1997) .

1.7. Residues Detection Methods

On basic limitation to conduct residues and risk analysis is the detection of chemical residues in edible animal product. Without accurate detection, exact risk is impossible to assess. This process needs highly qualified expertise, sensitive instruments and modern analytical techniques **.**Residues from these substances may be present in edible tissues, milk and eggs for human consumption and may exert different levels of toxicity on consumers when consuming them. (Mitchell, *et al*., 1997). Without accurate detection, exact risk is impossible to assess. This process needs highly qualified expertise, sensitive instruments and modern analytical techniques. (Seri, 2013) .Currently there are six types of detection methods commonly used for the detection of antimicrobial residues in foods, (Mitchell. *et al*., 1997).

1.7.1. Microbiological Inhibition Assays

The earliest methods used for the detection of antimicrobial residues in foods were based on the detection of growth inhibition of various sensitive bacterial strains .Such methods, originally developed for use in clinical medicine, were based on microbial agar diffusion tests are based on reaction between a bacteria and the antibiotic present in the sample. Different inhibitory tests were develop

to screen different animal products (Popelka. *et al*., 2004) .or the inhibition of acid production or coagulation by starter organisms.

1.7.2. Microbial Receptor Assays

The CHARM 1 and 11 tests are qualitative microbial receptor assays for the rapid detection of B-lactams, macrolides, aminoglycosides, tetracycline, chloramphenicol and sulphonamides in milk and tissue (Charm and Chi , 1982). The CHARM 1 test for B-lactams in milk with a test time of 15 minute CHARM tests use two types of bacterial cells containing either the natural receptor sites for antibiotics on or within the cell or an antibody coating (e.g. tetracycline and chloramphenicol test kits) and radiolabelled antibiotic(tracer reagent).

1.7.3. Enzymatic Colourimetric Assays

The penzyme test is a qualitative enzymatic method for the rapid detection of B-lactam antibiotics in milk (Knight.*et al*., 1987) the result available in 20 min. the test principle is based on detection of the inactivation of an enzyme by B-lactam antibiotics.

1.7.4. Receptor Binding Assays

The SNAP and Delvo-X Press tests for B-lactam antibiotics in milk are qualitative enzyme linked receptor binding protein conjugated to an enzyme to an enzyme (Rhoades.*et al*., 1995).

1.7.5. High Performance Liquid Chromatographic (HPLC)

Chromatography is commonly used for separating the components of a solution In drug analysis was originally used to verify drug levels in formulations ,fermentation broth or biological fluid for clinical application (Moats, 1990).the initial application of chromatographic method for the detection of drug residues in foods was very limited due to sensitivity .

Required and poor recovery from the more complex food matrices (Shaikh, 1993).There are several types of chromatographic methods currently in use for residue analysis. These include GC (gas Chromatography), TLC (thin layer

Chromatography), TLC/BA (thin layer Chromatography/bio autography), and HPLC (high pressure or high –performance liquid Chromatography) is commonly used detection method for residue analysis (Shaikh, 1993) .TLC has found some use, but this method is generally used only for screening or qualitative analysis.

1.7.6. Enzyme Linked Immunosorbent Assays (ELISA)

The specificity of the immune system is demonstrated by its ability to distinguish subtle differences between antigens (Ags) it works on the principle of antigen-antibody interactions and it is usually very specific and helps in detecting residues from in food producing animals .The enzyme-linked immunosorbent assay (ELISA) is commonly used and detection of antimicrobials is based an enzyme-labelled reagents. ELISA has proven very useful for residual screening in meat especially for tylosin and tetracycline (Mahgoub.*et al*., 2006). ELISA's antigen-quantification could take different forms like the direct and indirect sandwich ELISA. Sandwich ELISA works on the principle of recognizing specific antigens that share similar epitopes with other antigens. The indirect sandwich ELISA has the advantage of being highly specific and sensitive. Radioimmunoassay measures the radioactivity of immunological complex using a counter (Samarajeewa, *et al*., 1991).

1.8. Laboratory Analysis

It Is Provided By MHO, SSMO, MOAR, MOI, and MOAR In Collaboration With Universities And Research Institutes And Centers (Mustafa, et *al*., 2016).

1.9. Control and Preventive Measures

In general, the residue control strategy is based on a two-step approach

(1) The detection of residues using sensitive tests with a low rate of false negatives

(2) followed by confirmation, requiring quantification against the MRL and identification with a low rate of false positives (Mensah , *et al*.,2014) Hence, the residue prevention strategy is based on preventing entry of violative

residues in meat or milk intended for human consumption by proper drug use guide developed for use by both veterinarians and food animal (Dairy and Beef) producers include the following : Herd health management; all food animals should be maintained in a clean and healthy environment whenever possible. Drug residues are best avoided by implementing management practice (good nutritional to meet growth, maintenance and lactation needs) and herd health program that keep animals healthy and producing efficiently; Use of approved drugs; dairy and beef producers should not use or store un-approved drugs, special mixes, or products within adequate labels as unapproved drugs have no data regarding efficacy, safety, or withholding time. the herd veterinarian should be certain that ELU involves only approving products; Establishment of valid veterinarian-client-patient relationship; the use of prescription drug and the ELU necessitate a veterinary-client-patient relationship, which is established hence a veterinarian is closely with the owner in health management of the herd Proper drug administration and identification of treated animals before administering or dispensing drugs one has to: know the drugs approved for all classes of cattle on the farm and be familiar with approved dosage, route of administration, and withholding time; Proper maintenance of treatment records and identification of treated animals; institute a workable health record for each animal to record all health related events, including administration of medication. Record the identification of all animals in the permanent health record book. Having proper drug residue testing capabilities really available on and off the farm; this control point address the conditions under which residue testing should be considered; the proper selection and interpretation of tests; the inherent limitation and potential misuse of residue testing; and Creating awareness of proper drug use, and methods to avoid marketing adulterated products principally educational, total residue avoidance program is based upon the objective of improving the

livestock producer's management and quality control of marketing animals with emphasis on avoidance of drug residues (Scippo.*et al*.,1994) .

1.10. Role of Veterinarians in Providing Residue-Free Animal Food

Veterinarians are not primarily concerned with the increase in production by treating the sick animals and poultry but their important job is to ensure quality (residue free) edible animal products such as milk, meat and eggs to the public, the implementations of WTO regulations demand that veterinarians working in food animal medicine should learn how to avoid drug/chemical residues in food animals and disseminate this information to the farmers to safeguard the health of general public, this issue is also of paramount importance for the veterinarians employed in pharmaceutical and regulatory sectors responsible for assessing the fate of drugs and chemicals that enter the human food chain via the edible products It is also need of the day that environmentalists, toxicologists and non-government organizations (NGO) should pay due attention towards this issue ,this is necessary to conduct complete risk assessment , risk management , risk communication studies and implement certain legislative measures to safeguard the public health (Muhammad. *et al* ., 2009).

1.11. Contribution Of livestock To Sudan's Economy

Prior to the discovery and export of oil and gold, Sudan generated 20-25% of its foreign exchange earnings from live animals, meat, hide and skin exports. In 2013 foreign earning from the export of live animals, carcasses, hide &skins amounted to the US $ 682,061 and represented 10.6% of total foreign earnings in that year, despite the importance of the livestock sector, it receives a small portion of spending on agricultural development. Generally, resource allocations for livestock and animal health services are small and are not commensurate with the revenues generated by the sector ,Sudan expected to embark in the near future on a large scale food production initiative sponsored by the Arab Fund for social and economic development to secure food for Arab countries. Production of food of animal origin is an integral part of this plan ,this emphasize the leading role

Sudanese livestock is expected to play in bridging a part of the red meat supply gap to t Arab country, (MOAR,2015) .

Sudan produces about 43% of the total production of red meat in the Arab nation, so animal wealth played an important role in macroeconomic and social life .(Nahla,2012).

1.12. Marketing of Livestock in the Sudan

Sudan is a competing country of the livestock products (meat), the country exporting both of a live and meat of sheep, Sheep marketing in Sudan is characterized by traditional operations and is informally organized, although, recently there are great efforts by the formal livestock authorities to organize some secondary and terminal livestock markets , the sheep exports mainly to Saudi Arabia and the Gulf countries and constitute about 80% of livestock export followed by goats 10.5%, camels and cows exported to Egypt and 9% of some other cattle. Exports are mainly mutton, whose annual exports range between 84% and 95% of the total quantity of meat exported. (Babiker. *et al*., 2011).

In Sudan the private sector organizes and finances the livestock marketing process while the government develops and manages the markets, regulates animal health, quarantine, and meat hygiene and quality control measure. (MOAR, 2015).

Livestock and meat prices are based on supply and demand interaction and often through middlemen, purchases could take place directly in production areas or in primary (village small urban settlements), secondary (bigger urban center) or terminal markets where animals are supplied in large numbers and from all parts of the country, selling and buying are arranged by middlemen based on eye valuing of animals weight and stamina, and payment differed until animals are sold. Marketing based on traditional businesses consequently leading to supply fluctuations according to price setting strategies of livestock traders .Livestock marketing costs are high due the high cost of transportation, veterinary services, taxes and fees, sale yard costs and cost of losses due to death and reductions in animal's weight .There are different livestock markets in Sudan In order to

increase Sudan's share in livestock and meat export market, strict welfare, hygiene, and disease control regulations in livestock sector must be considered.(MOAR, 2015) .

1.13. Sanitary Constraints of livestock Export Trade

Sanitary constraints relate as much to animal health as to food safety. In terms of animal health, the main constraints are animal diseases (persistence of major epizootic diseases and zoonoses), lack of quarantine infrastructure, compliance with standards and regulations (Sanitary and Phyto- sanitary measures) and the lack of product control laboratories. The constraint that face Sudanese livestock trade include lack of laboratories of the control of residues and contaminants, labelling deficiencies, absence or non-compliance of certificates of origin To overcome these constraints, political measures already exist or are envisaged by individual states. These include laws and decrees relating to veterinary medicine and protection of animal health, control of animal diseases, veterinary inspection at border posts, notifiable diseases, sanitary safety of the plant, animal and food, specific rules on the organization of official controls of a product of animal origin intended for human consumption, animal health checks, risk analysis in animal health, animal movement control, animal identification and traceability. Great concern should be given to quality standards and excellence, health certificates and general hygiene for live and slaughtered animals. (MOAR, 2015).

1.14. Organizations Involved in Food law Enforcement in Sudan

Activities and responsibilities of food safety management and inspection are coordinated between several organizations. These are Ministry of Health (MOH), Sudanese Standards and Metrology Organization (SSMO), Ministry of Agriculture and Forestry (MOAF), Ministry of Animal Resources (MOAR), Ministry of Foreign Trade (MOFT), Ministry of Environment (MOE) and Ministry of Industry (MOI). Local authorities are enforcing food safety laws through the activities carried out by veterinarians and health officers (Mustafa, *et al.*, 2016).

1.15 Regulations 0f Food Safety and Hygiene laws In Sudan

The Sudanese food safety laws centre on protecting the consumer using inspection and testing" methods as HACCP and other quality management systems are not yet established. The legal frame of food safety in Sudan started with the Public Health Act (1939) which deals with food hygiene issues. The Act delegated the responsibility of food inspection to the MOH (Directorate of Environmental Health and Food Control).In 1973 the Food Control Act (1973) was passed from the National Assembly and in accordance with this Act the MOH issued the Necessary regulations such as General Health Requirements of Food Processing Establishments (1977). Food-borne disease surveillance is also carried out by the MOH (Department of Epidemiology). As far as regulations of food of animal origin the MOAR has got its own mandate. It carries out inspection in the field of animal health, meat, fish and fishery products and enforces the Acts of Federal Meat Inspection Act (1974), Federal Veterinary Health Quarantine for Exported and Imported Live Animals and Meat Act (2004) and Animal welfare Act (2015).The Sudanese Standards and Metrology Organization (SSMO) was established in the year 1992 and since then it has taken over the full responsibility of issuing all commodity standards including food , also enforced the 2008 Act, which gives the organization the power to inspect all food commodities produced locally, as well as imported or exported foods Certification audits for management systems, products and food safety are provided on demand by it. (Mustafa, *et al*., 2016).

1.16. Registration of Veterinary Drug in Sudan

Sudan has a National Registration System (Frans, 2015). The National Medicines and Poisons Board (NMPB) under the Ministry of Health has the mandate to regulate food, human drugs, veterinary drugs and medical devices and to ensure adequate and effective standards .The applicant for registration of pharmaceutical(Gamal and Abdeen, 2012) must submit all prescribed data and the certificates required under the WHO certification scheme for a pharmaceutical

product moving into international commerce, and any other information that is necessary for assuring the quality, efficiency and stability of the product through its shelf life (NDP, 1997).

1.17. Socio-Economic of livestock

At no time in the last decade has the contribution of petroleum to GDP come close to equalling the contribution of agriculture, of which livestock provides the biggest part (Table 1), Livestock is by value the largest subsector of Sudan's domestic economy larger even than petroleum.

Table 1: Comparison of Red Meat Prices with Oil (Petrol)

Unit (ton)	Value $	Unit	Value$	equivalent
Sheep Meat	5760	Oil Barrel (OPEC) Raw	$ 61.04/Barrel 	94.36 Barrel oil
Cattle Meat	4500	Oil Barrel (OPEC) Raw	$ 61.04/Barrel	78.2 Barrel oil
Sheep head	213	Oil Barrel (OPEC) Raw	$ 61.04/Barrel	4.2 Barrel oil
Cattle head	600	Oil Barrel (OPEC) Raw	$ 61.04/Barrel	11.7 Barrel oil

Source: Ministry of Animal Resource

1.17.1. Consumption of livestock And Red Meat in Sudan

The local consumption of red meat in Sudan (Table 2) increased from 1028 thousand tons in year 2013 to 1086 thousand tons in 2018. For example, the local consumption of beef increased from 661 thousand tons (64.2 per cent) in 2013 to 711thousand tons (65.4 per cent) in 2018.and followed by sheep (about 17.8 per cent) to (17.03 per cent) in 2018, goats (10.1per cent) to (9.9per cent) in 2018 and camels (7.7 per cent) to (7.6 per cent) in 2018 .According to the Ministry data, the total number of animals slaughtered for local consumption was 32032 thousand head in 2013 to 32831 thousand in 2018 representing (30 per cent) of the livestock population. In spite of the overwhelming market share of cattle, it is sheep that

provide the meat of choice as reflected by the higher market price. This result due to Meat production increased significantly in the last decades supported by increased animal slaughter rather than increased productivity .The demand for meat is especially high in density populated areas of central Sudan with rapid urbanization, internally displaced people and relative high disposal income on food items.

Table 2: Slaughtered Animals and Meat Production for local Consumption

Year	No. of Slaughtered Animal (000)					Local Consumption (000)				
	Cattle	sheep	Goat	Camel	Total	Cattle	sheep	Goat	Camel	Total
2013	3306	15350	12863	513	32032	661	184	103	80	1028
2014	3336	15400	12866	520	32122	667	185	103	81	1036
2015	3358	15450	12951	524	32283	672	185	104	81	1042
2016	3402	15400	13166	530	32498	680	185	105	82	1052
2017	3471	15400	13262	532	32665	694	185	106	82	1067
2018	3553	15400	13343	535	32831	711	185	107	83	1086

Source: Ministry of Animal Resource

Livestock total production from (2012-2018) It can be noted from the (Table 3), that is remained stabilized from the (2012-2015) this was due to animals in Sudan depend mainly on natural grazing which leads to a change in the production and quality and the livestock access and movement including; access the range and pasture, insecurity (Darfur and Kordofan main supply of sheep and camels) and lacking the sources of water. A dip from a small apart of livestock has been increased between the years of (2016-2017) due to Improved productivity and achieved more favourable total environmental including input supply and availability of extension and veterinary services and economic conditions were available .

Table 3: Estimates of Animal Products Ton (000)

Year	Red Meat	Milk	Hides &Skins
2012	1456	4318	53
2013	1466	4359	53.5
2014	1476	4391	53.8
2015	1484	4452	54.1
2016	1502	4507	55
2017	1519	4553	55.5
2018	1540	4591	56.1

Source: Ministry of Animal Resource and Rangeland

Animals are not managed for high off-take, (Table 4) or to maximize their value for meat production. Among other obstacles to be overcome is a weakness of market infrastructure, animal health, extension system and lack of market management activities reflected in the uncontrolled entry of livestock to markets and the absence of marketing information, such as registration and pricing.

Table 4: Estimate of Animal and Off-Take Head (000)

Year	Cattle		Sheep		Goats		Camels	
	Off-take	No.animal	Off-take	No.animal	Off-take	No.animal	Off-take	No.animal
2014	14366	31029	19798	39846	14366	31029	920	4792
2015	14451	31227	19980	40210	14451	31227	924	4809
2016	14666	31481	20461	40612	14666	31481	930	4830
2017	14762	31659	20580	40752	14762	31659	932	4850
2018	14843	31837	20701	40846	14843	31837	935	4872

Source: Ministry of Animal Resource and Rangeland

1.17.2. Livestock and Red Meat Products Export Of Sudan

The target implementation of livestock export 74.2% in 2017, and increased to 86.3% in year 2018, although the meat in year 2017 41.6% and decline in 2018 10.1% (Table 5).So the products have to meet the standard requirements before they are eligible for export. And the quality and safety control system have to possess certain elements to be effective. Briefly, these elements include law and

regulations, inspection services, meat hygiene, support services, administrative procedure, marking, certification.

Table 5: The Target Implementation of livestock Export

2017	Target	Implementation	Percentage of Target%
Livestock	**6,988,981**	**5,183,645**	**74.2**
Meat	34,024	14,138.394	41.6
2018			
Livestock	4,094,773	4,745,881	86.3
Meat	**2974.675**	**29,392**	**10.1**

Source: Ministry of Animal Resources, Fisheries and Rangeland

For the period 2012-2018, shows (Table 6) the live animals export have significantly increased could be attributed to many factors including improvement in the quarantine facilities, decentralization of quarantine measures and issuing of standard operating procedures for imports and exports. In response to the strong export market in the Gulf countries, especially Saudi Arabia the Sudanese live sheep exports increased from 3,757,363 in 2013 to reach 4,760,747 in year 2018.

Table 6: Livestock Exports for Years Head (000)

Year	Camel	Goat	Sheep	Cattle
2012	166240	162116	3415739	26145
2013	129647	197958	3757363	11202
2014	152.096	318783	4539.955	19.459
2015	206,008	445842	5,459,205	45,825
2016	220.665	271,647	4,411,956	100,655
2017	253.483	282,884	4,530,676	116,602
2018	194,049	248,823	4,760,747	112,837

Source: Ministry of Animal Resource and Fisheries

Livestock meat exports (Table 7) declined in the year (2013) constrained by poor market organization and infrastructure lacking market transparency, disorganized tax levies, high Market transaction cost, shortage of finance, appreciation of the Sudanese currency, and delayed payment system practiced by traders and exporter. In the years 2014-2017 when the export began to increase rapidly in response to a several explanations of this improvement, were associate factors of easy movement, nutritional status, pastures and this probably due to some politics

and restriction to export, hygiene, and disease control regulations in livestock sector and the world food-meat prices.

Table 7: The Sudan - Meat Exports, Ton (000)

year	Camel	Goat	Sheep	Cattle
2012	4751	30837	39483	29840
2013	4773	30984	39568	30010
2014	4792	31029	39846	30191
2015	4809	31227	40210	30376
2016	4830	31481	40612	30632
2017	4850	31659	40752	30926

Source: Ministry of Animal Resource

The performance of these slaughterhouses is considered below the international standards required by importing countries as they lack of hygienic operating conditions, poor meat processing facilities, lack of adequate cold storage facilities and appropriate packing material. They also work with less than the designed capacities and are either deficient in infrastructure or need renovation to comply with full slaughter environment and standard. The use of by- product is very limited which substantially raises the cost of the meat to the consumer.

Table 8: Export Slaughter Houses

Slaughter - Houses	**Production Capacity Head/Day**		**Capacity/Ton/Day**		**Slaughter/Time**	
	Sheep	**Cattle**	**Sheep**	**Cattle**	**Sheep**	**Cattle**
Kadru	2000	300	20	60	200	30
Ganawa	1500	300	15	60	150	30
Sabaloga	1500	200	15	40	150	20
Gimco	2000	150	20	30	200	15
Karari	1000	150	10	30	100	15
Niyala	1000	150	10	30	100	15
Gadarif	1000	150	10	30	100	15
Atbara	1000	150	10	30	100	15
Rdwan	-	150	-	-	-	25
Total	**11000**	**1700**	**110**	**310**	**1100**	**180**

Source: Ministry of Animal Resources &Rangeland

1.17.3. Export Price for livestock And Red Meat

The Ministry of Foreign Trade sets minimum export prices (official price per ton of meat) as an indicator for exporters and as a bench mark for bank transactions.in (Table 9) explain. The actual export cost /price is higher than those announced floor price .For example, the price of lamb-meat, reported by Sudanese sheep exporting company, was US$ 6800 per ton compared to official price of US$ 3650 per ton in the year 2011, while the price of cattle-meat exported to Egypt, reported by a Sudanese /Egyptian exporting company, was US$ 5400 per ton against the official price of US$ 1750 for the same year.

Table 9: Sudan Official Red Meat Export Prices Versus Actual Prices in 2011(US$/Ton)

Type of Meat	Official Price	Actual Price
Beef	1750	5400
Mutton	3650	6800
Goat meat	2450	Na
Camel meat	1750	Na

Source: Ministry of Foreign Trade and Select Meat Exporters, 2011.
Na:not available.

Chapter Two

Materials and Method

2.1. Questionnaire and Data Collection

During four months between December 2017 and March, 2018, two questionnaires (Veterinarian and producers) Fifty veterinarians and other related jobs The majority of respondents were designed to collect information about drugs used knowledge about withdrawal period and the risk of using animal's products during this period, veterinarian guidance about the importance of not using animal products during withdrawal period, and disposal of waste vials

The questionnaire included three parts, the first part (n = 5 questions) open questions regarding information about the uses of drug, the second part (n = 20 questions) Yes or No general question, and the third part about how drug used by animal producer.

Fifty two number of farm, (42%) of respondents were work in dairy type of production, while 37% were work in meat type, and 21 were work in both type of production (dairy and meat), were randomly chosen. The questionnaire included 3 parts: the first part (n = 2 questions) questions regarding general information about the farmers. The second part (n = 7 questions) was about farms and current management and husbandry practices, and the third part (n = 16 questions) herd health problems. The farms were selected according to the responders ability to participate and the 52 questionnaires were filled by direct interviewing of the responding farm' owners from Khartoum, Omdurman and Bahri. Observations were carried out to determine farm conditions and to identify potential problems encountered. Herds were stratified into three groups (according to the herd size). The herd size was estimated in numbers of heads in each herd follows: < 50 head small herd, n =15, from 51 to 100; medium herd, n =26 and >101 large herd, n = 11.

2.2. Method of Collection of Samples

Structured questionnaire was designed to collect information about the drugs used knowledge about withdrawal period and the risk of using animal's products during this period, veterinarian guidance about the importance of not using animal products during withdrawal period, record and disposal of waste vials.

2.3. Statistical Analysis

The Descriptive statistical analysis (frequency , descriptive, and cross tabulation tests) for the respondents (veterinarians and other related jobs and Breeder) was done by using Statistical Package for Social Sciences (SPSS version 20) programme, and graphs was done by using Microsoft Office Excel (Office 10) programme .

Chapter Three

Result

3.1. Result of Questionnaire

Table (1) shows 36% of respondents were in age group 41-50 years, while 33 % in more than 50 years, 29% in 31- 40 years, and only 2% were found in age group 20-30 years.

Table (1) Age of Respondents

Age Group	Frequency	Percent (%)
20-30	1	2
31-40	15	29
41-50	19	36
more than 50	17	33
Total	52	100

Source: Researcher Questionnaire Data

Figure (1) shows that the majority of respondents (77%) were educated, while 15% were none educated, and (8%) of respondents did not answer for qualification.

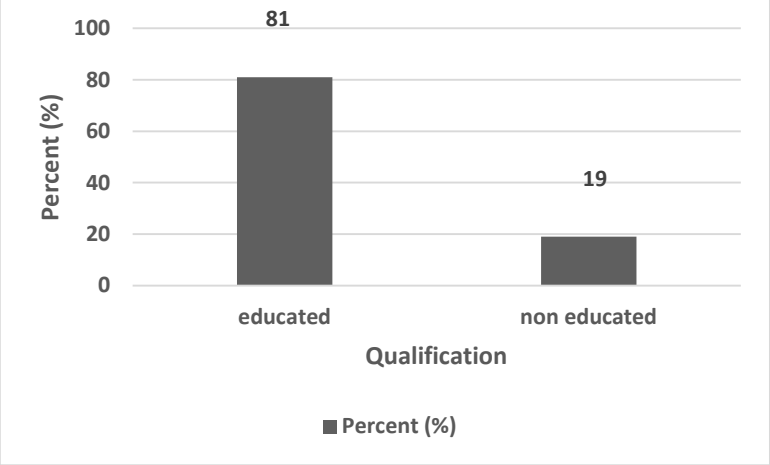


Figure (1) Qualification

Description of Herd and Management

Figure (2) shows that 58% of respondents were used traditional farm system, while 29% used sedentary system, 13% used semi pastoral system.

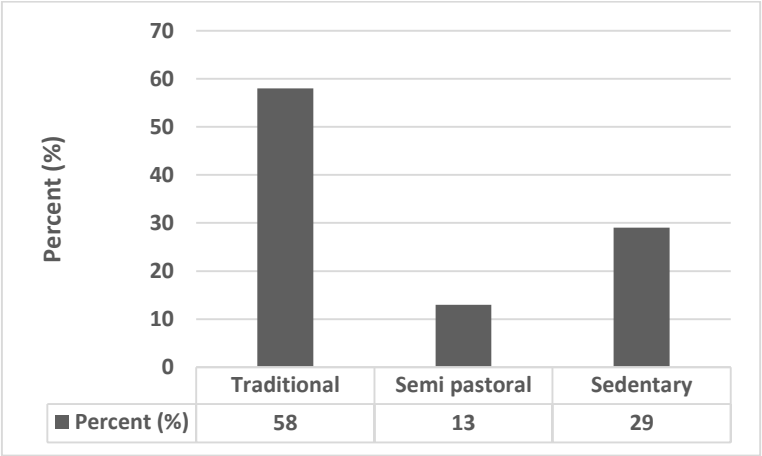


Figure (2) Farm System for the Project

Figure (3) shows that 50% of respondents had medium herd size, while 29% had small herd size, and 21% had large herd size

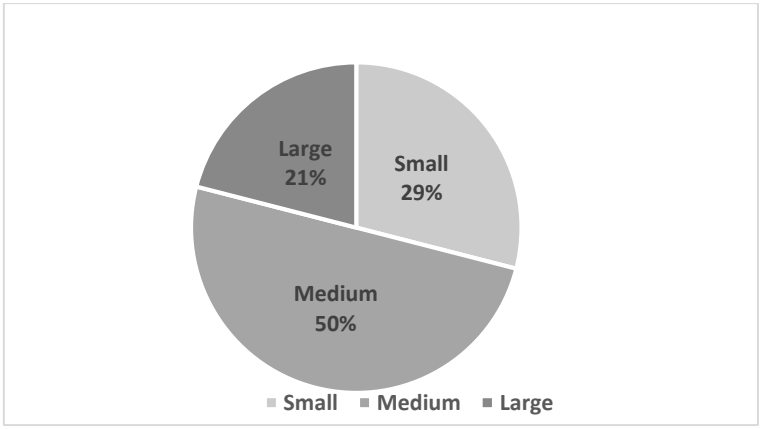
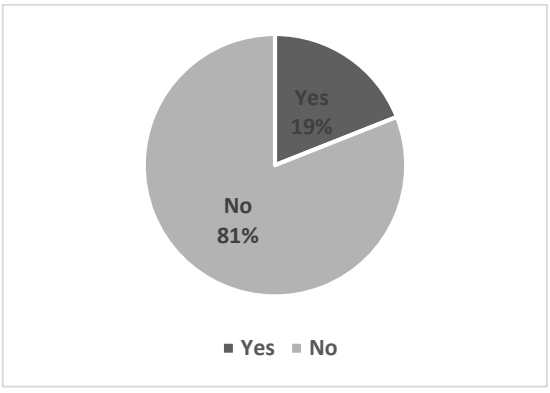


Figure (3) Herd Size

Figure (4) shows that the majority of respondents (81%) did not breed different animals in the same farm, while 19% did.



Source: Researcher Questionnaire Data

Figure (4) Breeding of different animals in the same farm

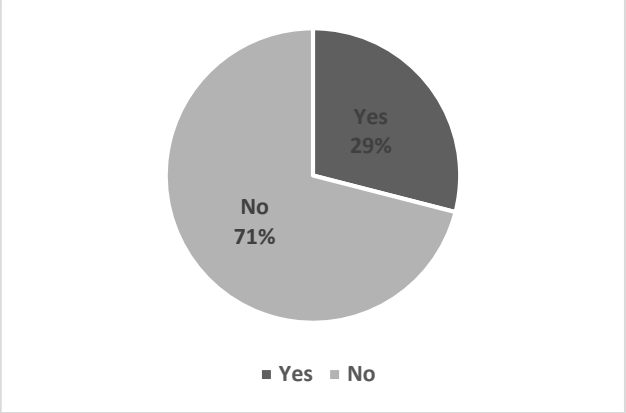
Table (2) shows that most of respondents worked in dairy type of production (42%) , while 37% were worked in meat type, and 21 worked in both type of production (dairy and meat).

Table (2): Production Type

Production Type	Frequency	Percent (%)
Dairy	22	42
Meat	19	37
The both	11	21
Total	52	100

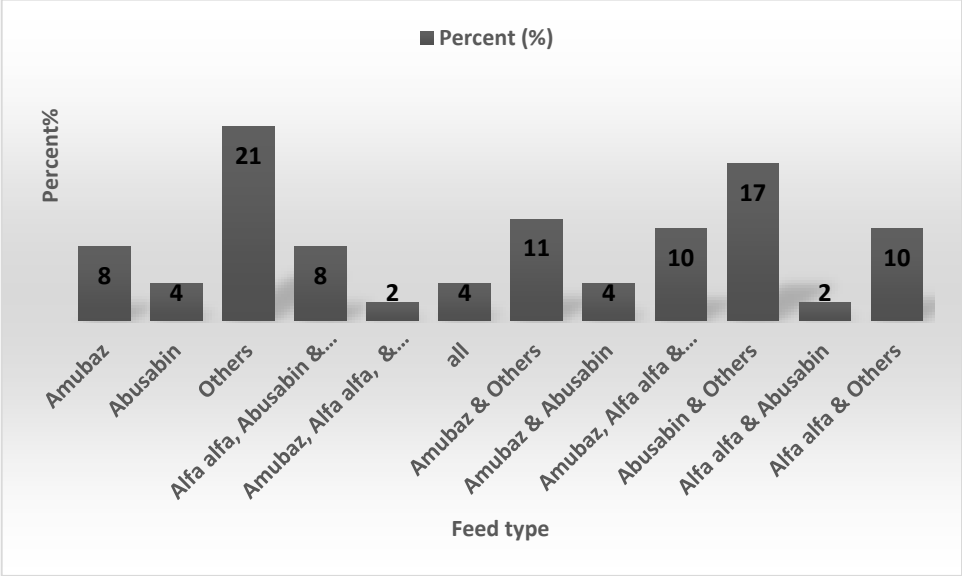
Source: Researcher Questionnaire Data

Figure (5) shows that the majority of respondents (71%) did not had animal identification system, while 29 % had.



Source: Researcher Questionnaire Data
Figure (5): Animal Identification System

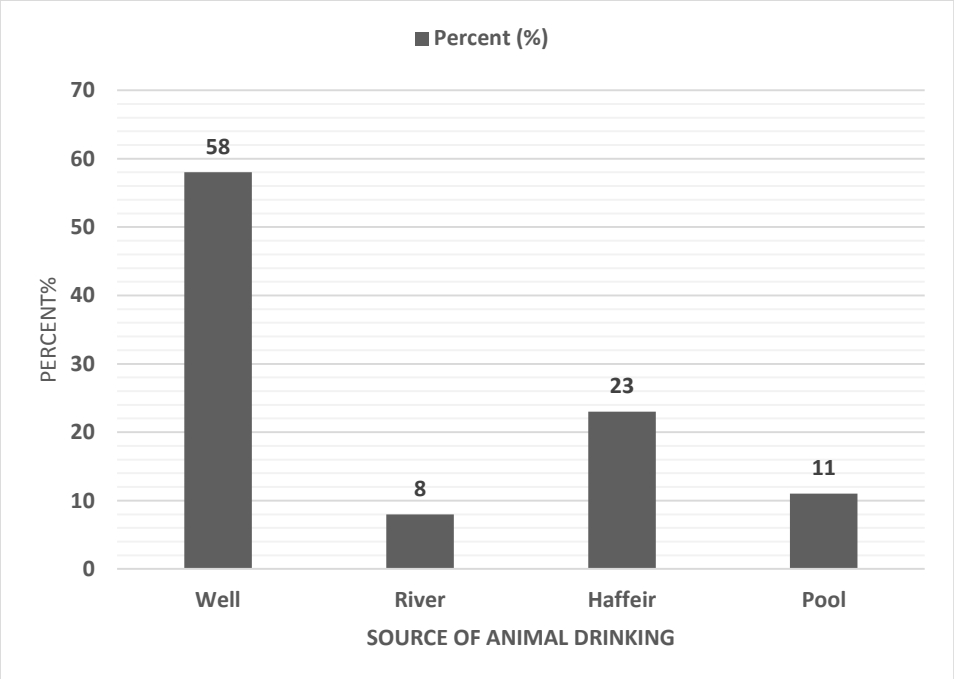
Figure (6) shows that 21% of respondents were used other animal feed rather than Amubaz, Abu Sabin, and Alfa Alfa, while 17% used Abu Sabin and Other type of animal feed, 11% used Amubaz and Other type of feed, 4% depended on Abu Sabin, 4% depended on all type of feed, and 46 of respondents were feed their animal mixed type of feed (Abu Sabin, Amubaz, Alfa Alfa), and other type of animal feed.



Source: Research Questionnaire data

Figure (6) Type of Animal Feed

Figure (7) shows that 58% of respondent depended on well as a source for animal drinking, while 23% on haffeir, 11% on pool, and 8% on river.



Source: Research Questionnaire Data

Figure (7) Source of Animal Drinking

Awareness owners of the residues veterinary drugs

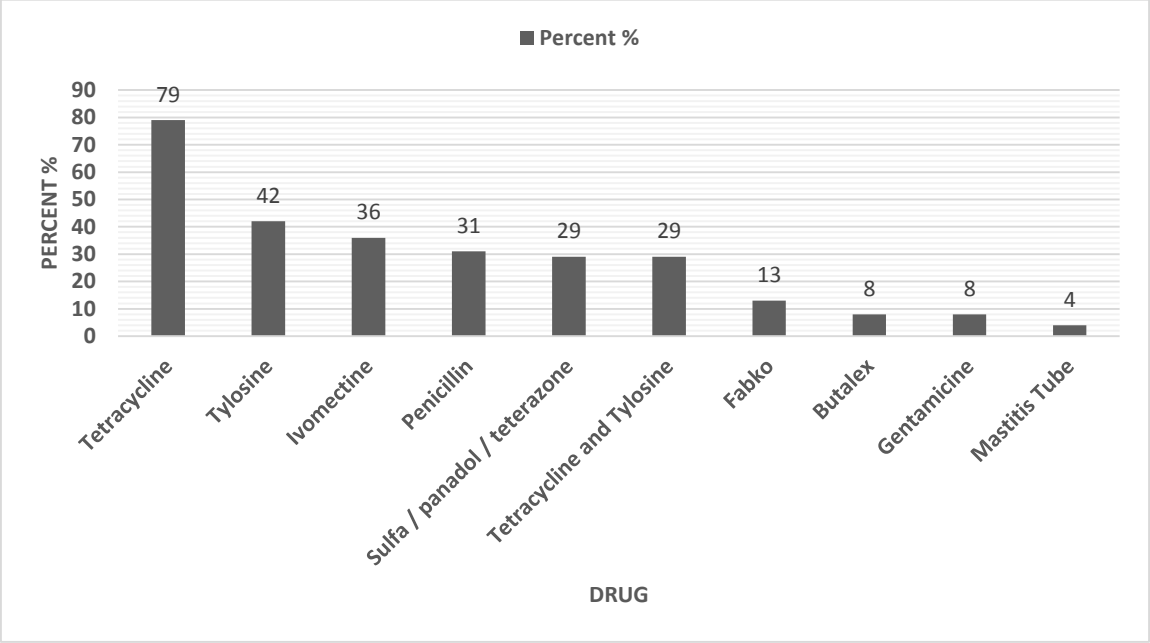
Table (3) shows that the majority of respondents 79% useded veterinary drugs for both treatment and preventive, while 21% used it only for treatment.

Table (3): Uses of Veterinary Drugs

Item	Frequency	Percent (%)
Treatment	**11**	**21**
Both (Treatment &Preventive)	**41**	**79**
Total	**52**	**100**

Sources: Research Questionnaire Data

Figure (8) shows that The majority of respondents (79%) used Tetracycline as most commonly used drug in their farm, 42% Tylosine, 36% used Ivomectine, 31% Penicillin, 29% Sulfa / panadol / teterazone, 29% the both Tetracycline and Tylosine, 13% Fabko, 8% Butalex, 8% Gentamicine, and 4% used Mastitis Tube.



Source: Researcher Questionnaire Data

Figure (8) The Most Commonly Used Drugs in Respondent's Farm

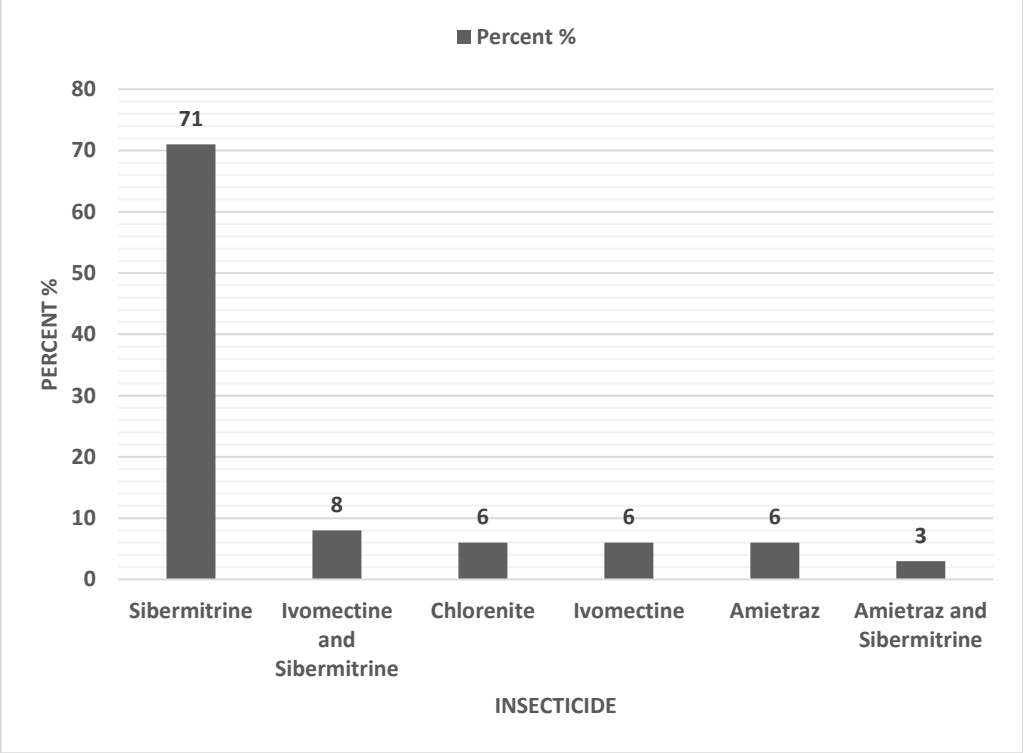
Table (4) shows that the majority of respondents 90% reported had veterinary services in their areas, while 10% no service.

Table (4)

Presence Of Veterinary Services In The Area		
Item	**Frequency**	**Percent (%)**
Yes	**47**	**90**
No	**5**	**10**
Total	**52**	**100**

Source: Researcher Questionnaire Data

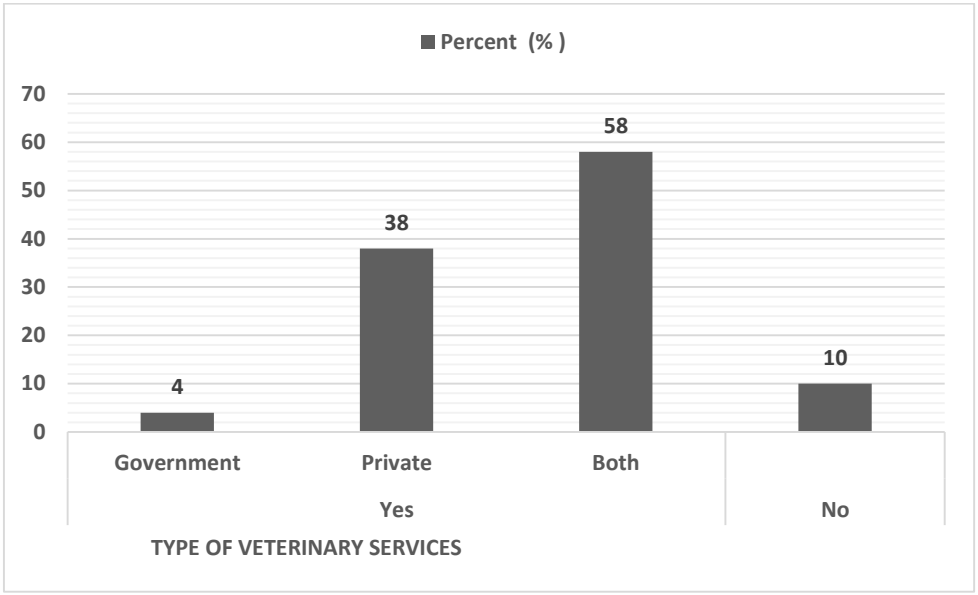
Figure(9) reported that the majority of respondents 71% used Sibermitrine as insecticide, while 8% used the both Ivermectine and Sibermitrine, 6% used Chlorenite, 6% used Ivermectine, 6% used Amitraz, and 3% used the both Amitraz and Sibermitrine.



Source: Researcher Questionnaire Data

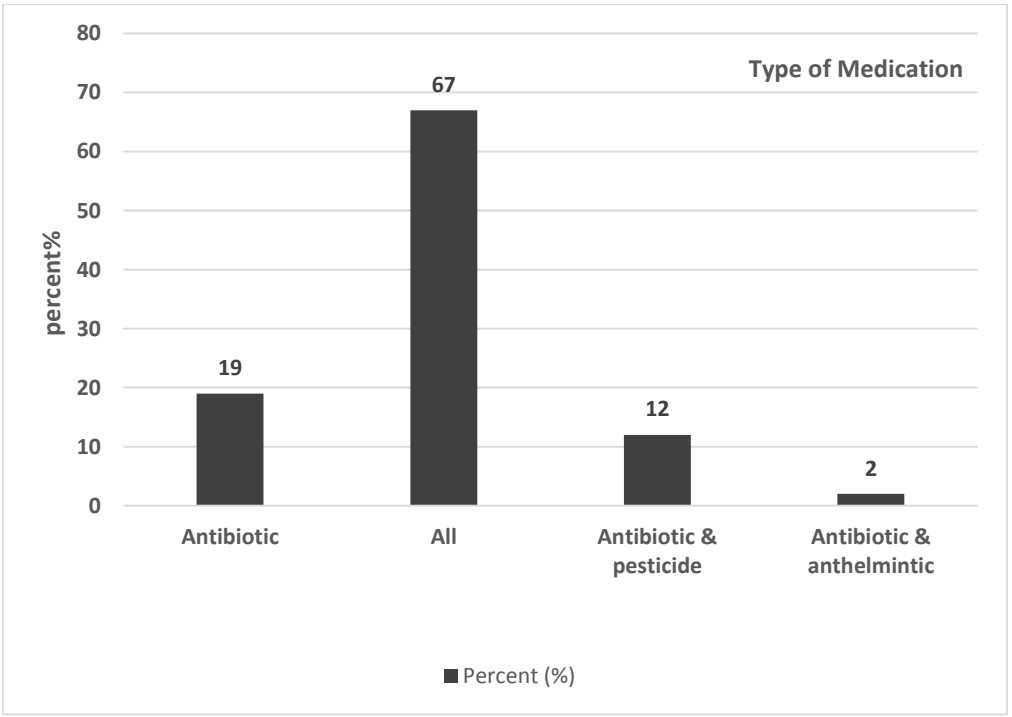
Figure (9) Type of Insecticides Used By Farmers

Figure (10) shows that 58% indicate both type (government and private) of veterinary services, while 38% of them had private type, only 4% had government type and 10% did not had.



Source: Researcher Questionnaire Data
Figure (10): Type of Veterinary Services

Figure (11) shows that the majority of respondent 67% used all type of medication for take care of their animals, while 19% used antibiotics, 12% used antibiotics and pesticides, and 2% used antibiotics and anthelmintic.



Source: Researcher Questionnaire Data
Figure (11) Type of Medication Used for Animal Care

Table (5) shows that the majority of respondents the common diseases in their farm area are Inflammations and other diseases (98%). and 2% Thileria and Jaundice.

Table 5

The most common diseases in respondents' farm area		
Disease	Frequency	Percent %
Inflammation & Others diseases	**51**	**98**
Thileria and Jaundice	**1**	**2**
Total	**52**	**100**

Source: Researcher Questionnaire Data

Table (5-1) shows that 31% of respondent reported the common inflammations in their farm area both pneumonia & mastitis, 23% pneumonia, 14% mastitis, 8% pneumonia & rotten Foot, 2% pneumonia, mastitis& rotten foot, 20% inflammations without mentioned it, and 2% no inflammations in their farm area.

Sub Table (5 -1) Inflamation

Inflammation	Frequency	Percent %
pneumonia & mastitis	**16**	**31**
pneumonia	**12**	**23**
mastitis	**7**	**14**
pneumonia & rotten Foot	**4**	**8**
inflammation	**10**	**20**
pneumonia , mastitis& rotten foot	**1**	**2**
No inflammation	**1**	**2**
Total	**52**	**100**

Source: Researcher Questionnaire Data

Table (5-2) show that 31% of respondents reported the common diseases in their farm area rather than inflammations are Bloat, 17% Milk fever, 14% Diarrhea, 14% Parasites, 9% Abortion, 9% Abu Regeeba, 5% Tick borne diseases, 5% Jaundice. 5% Thileria, and 5% Brucellosis.

Sub Table (5-2) Other Diseases Rather Than Inflammation

Inflammation	Frequency	Percent %
Bloat	**13**	**31**
Milk Fever	**7**	**17**
Diarrhea	**6**	**14**
Parasites	**6**	**14**
Abortion	**4**	**9**
Abu Regeeba	**4**	**9**
Tick Bore Diseases	**2**	**5**
Jaundice	**2**	**5**
Thileria	**2**	**5**
Brucellosis	**2**	**5**

Source: Researcher Questionnaire Data

Table (6) shows that the majority of respondent 65% reported veterinarian determined the drug for animal treatment, while 21% the both veterinarian and animal owner, 12% animal owner, and 2% veterinarian and para vet

Table (6)

Determination Of The Drug For Animal Treatment		
Item	**Frequency**	**Percent (%)**
Veterinarian	**34**	**65**
Animal Owner	**6**	**12**
Veterinarian & Animal Owner	**11**	**21**
Veterinarian & Para Vet	**1**	**2**
Total	**52**	**100**

Source: Researcher Questionnaire Data

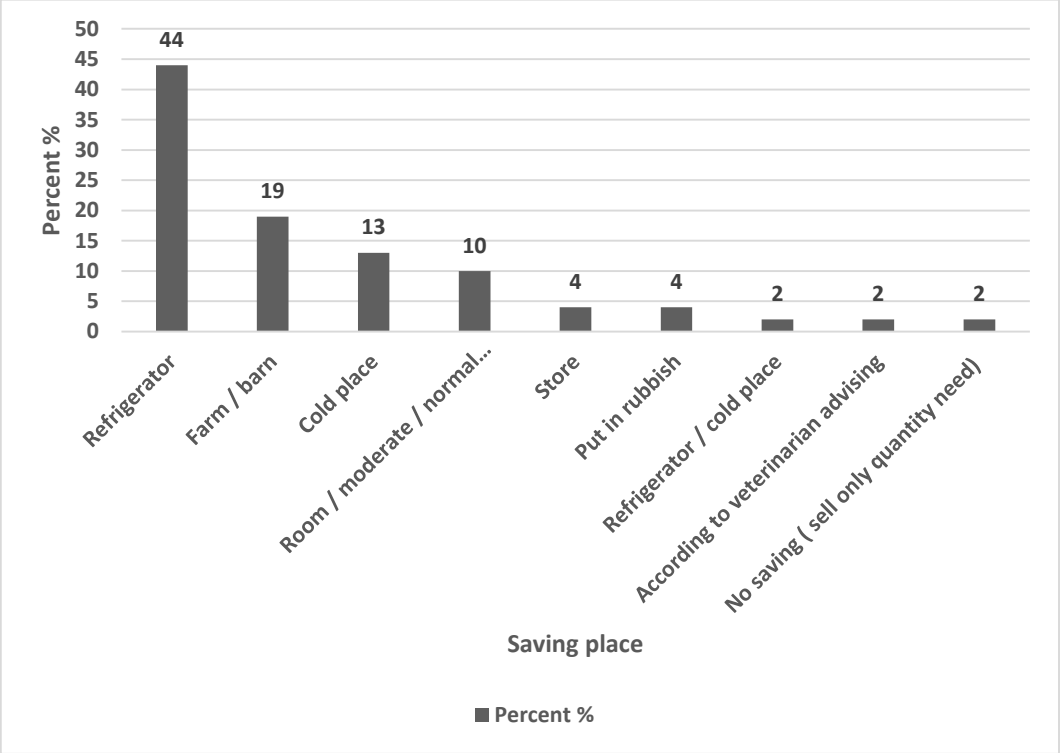
Table (6) shows that the majority of respondents 92% committed for treatment dose, and 8% of them did not.

Table (7)

Committed Breeders For Treatment Dose		
Item	**Frequency**	**Percent (%)**
Yes	**48**	**92**
No	**4**	**8**
Total	**52**	**100**

Source: Researcher Questionnaire Data

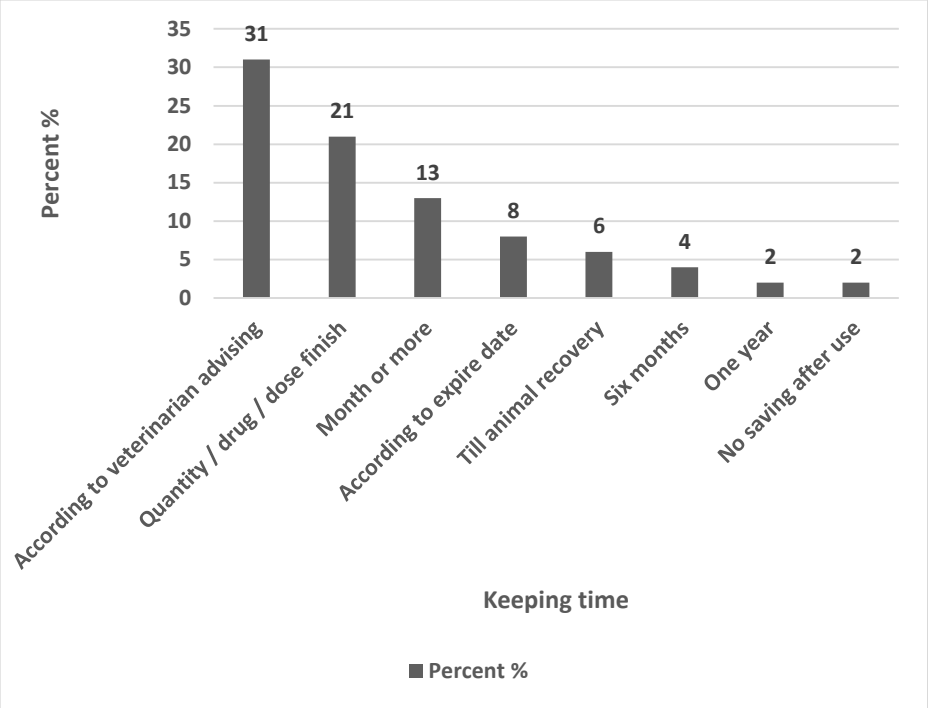
Figure (12) shows that 44% of respondents reported saved drugs in Refrigerator, 19% in farm / barn, 13% in cold place, 10% in room /moderate / normal temperature, 4% in store, 4% put in rubbish, 2% in refrigerator / cold place, 2% according to veterinarian advising, and 2% did not save drug they sell quantity according to need.



Source: Researcher Questionnaire Data

Figure (12) Saving Of Drugs after Taking

Figure (13) shows that (31%) of respondents answered that they kept drugs for time according to veterinarian advising, (21%) of them kept quantity , drug dose until finish,(13%) kept drugs for month or more,(8%) according to expire date, 6% till animal recovery, (4%) for six months, (2%) for one year, and (2%) did not save drug after use.



Source: Researcher Questionnaire Data

Figure (13) Keeping Time of Drugs

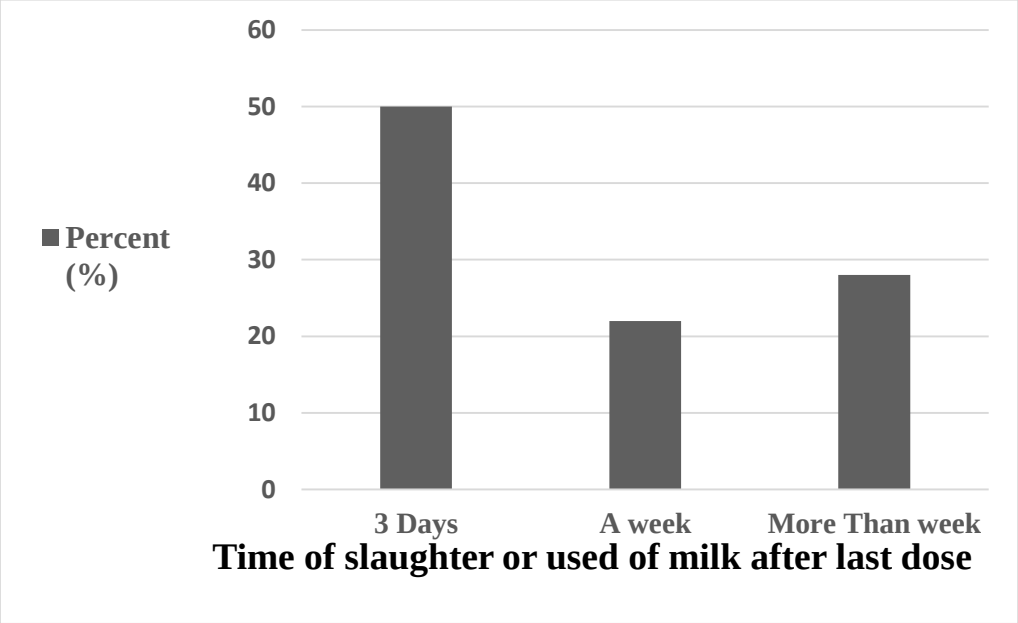
Table (8) shows that the majority of respondents (96%) did not use the drug after expired, while (2%) did, and (2%) sometimes were used expired drug.

Table (8)

The Drug Used After Expired		
Item	Frequency	Percent (%)
Yes	**1**	**2**
No	**50**	**96**
sometimes	**1**	**2**
Total	52	100

Source: Researcher Questionnaire Data

Figure (14) shows that (50%) of respondents reported waited for 3 days after giving the last dose of drug to slaughtered or milked, while (22%)waited for a week and (28%) more than week.



Source: Researcher Questionnaire

Figure (14) **After Giving the Last Dose of Drug How Much Time is Slaughtered or Used for Milk**

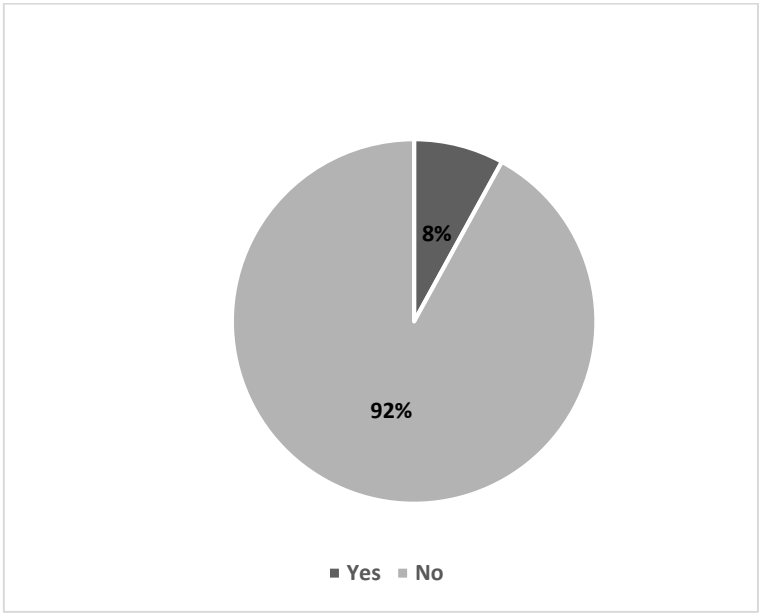
Table (9) shows that the majority of respondents (71%) did not keep records containing the name of medicine, doses and the date you gave it, and (29%) did.

Table (9)

Keeping Records of Medication &Doses		
Item	**Frequency**	**Percent (%)**
Yes	**15**	**29**
No	**37**	**71**
Total	**52**	**100**

Source: Researcher Questionnaire Data

Figure (15) shows that majority of respondents (92%) did not use growth promoter for their animals, and (8%) did.



Source: Researcher Questionnaire Data

Figure (15): Using of Growth Promoter for Animals

Table (10) shows that (67%) of respondents used insecticides to control ticks and insects that infect their animals and farms, and (33%) did not use insecticides.

Table (10)

Using Of Insecticides To Control Ticks And Insects		
Item	**Frequency**	**Percent (%)**
Yes	**35**	**67**
No	**17**	**33**
Total	**52**	**100**

Source: Researcher Questionnaire Data

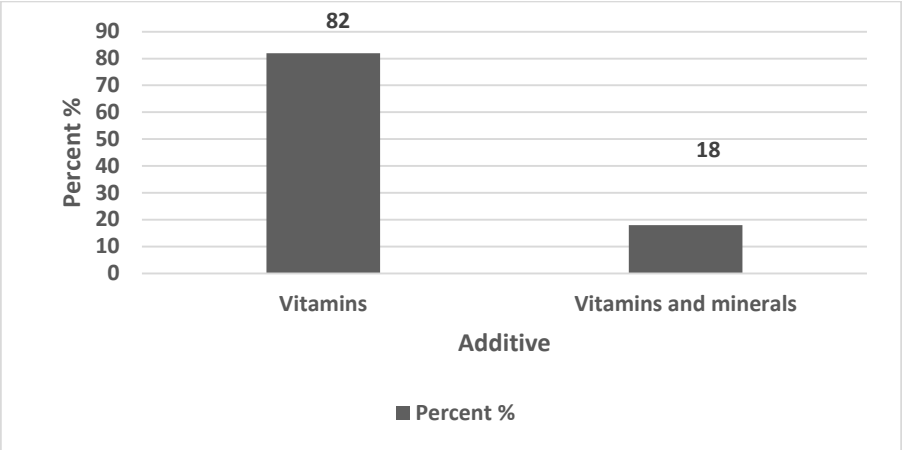
Table (11) shows that 67% of respondents did not use Additives in their Animal Feed, and 33% did.

Table (11)

Additives Used for Animal Feed		
Item	**Frequency**	**Percent (%)**
Yes	**17**	**33**
No	**35**	**67**
Total	**52**	**100**

Source: Researcher Questionnaire Data

Figure (16) shows that the majority of respondents (82%) used vitamins for additives in animal feed and (18 %) of them used the both vitamins and minerals.



Source: Researcher Questionnaire Data

Figure (16) Additives Used In Animal Feed

Table (12) shows that The majority of respondents (86%) answered yes for the Knowledge of dangerous of veterinary residues said that they knew that the veterinary drug residues affect the human health; while 14 % of them were said the drug residues deposit in milk / meat and affect the public health.

Table (12)

Dangerous of veterinary drug residues		
Item	**Frequency**	**Percent %**
Affect the human health	**18**	**86**
Deposits in milk and meat and affect the public heath	**3**	**14**
Total	**21**	**100**

Source: Researcher Questionnaire Data

The Descriptive statistical analysis (frequency, descriptive, and cross tabulation tests) for the respondents (veterinarians and other related jobs) was done by using Statistical Package for Social Sciences (SPSS version 20) programme, and graphs was done by using Microsoft Office Excel (Office 10) programme.

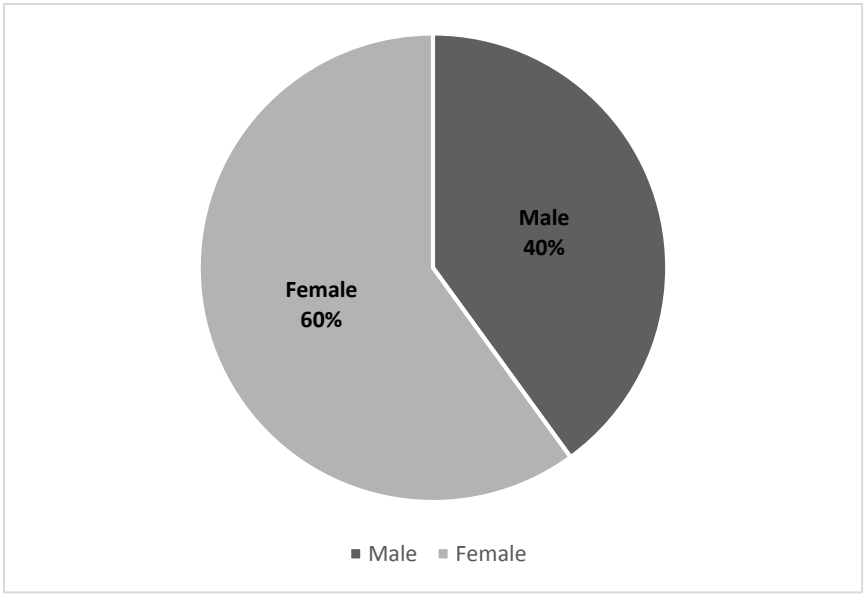
Table (13)

Age Of Respondents/Years					
	N	Minimum	Maximum	Mean	Std. Deviation
Age/Years	45	25	63	40	10.073

Source: researcher questionnaire data

The Average of Respondent's Age Was 40 Years.

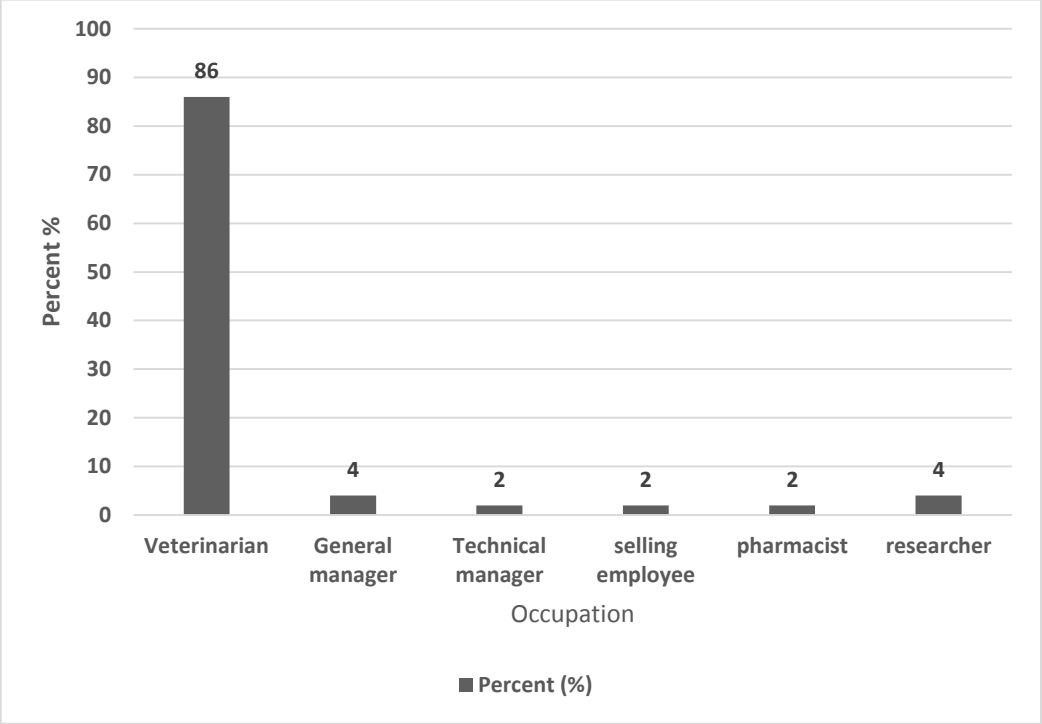
Figure (17) shows that 60% of respondents females, while 40 % of them males.



Source: Researcher Questionnaire Data

Figure (17) Gender of Respondents

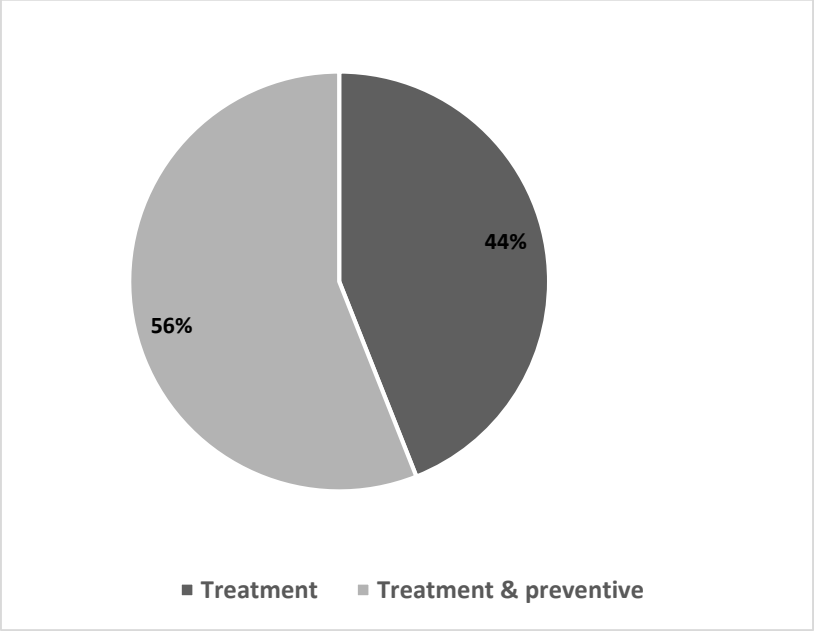
Figure (19) shows that the majority of respondents (86%) were veterinarians, (4%) general manager, (4%) researchers, while (2%) each for technical manager, selling employee, and pharmacist.



Source: Researcher Questionnaire Data

Figure (18): Occupation

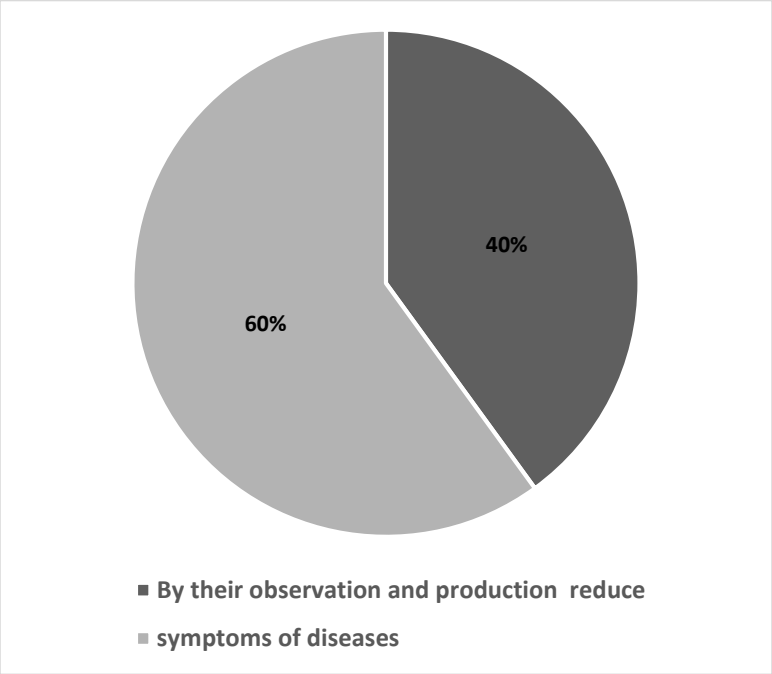
Figure (19) shows that (44%) used drugs for treatment when their animals sick (56%) for both treatment and preventive.



Source: Researcher Questionnaire Data

Figure (19) the Purpose of Farmers to Ask for Veterinary Drugs

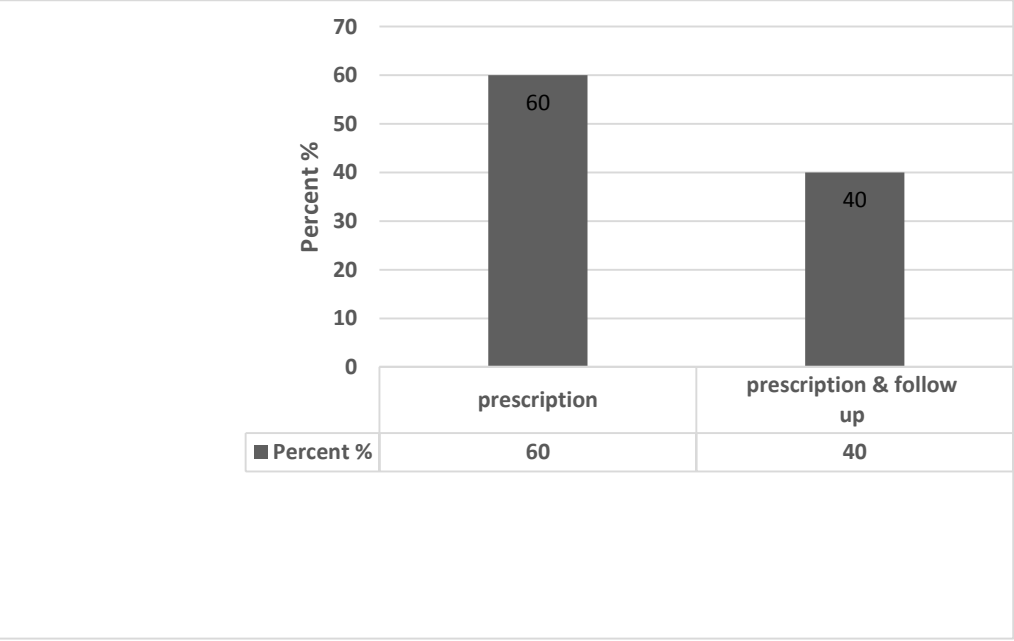
Figure (20) shows that the majority of respondents (40%) treated their animal's base on observation and production reduced and (60%) symptoms of diseases.



Source: Researcher Questionnaire Data

Figure (20) Frequent and Basis of Treated Animal

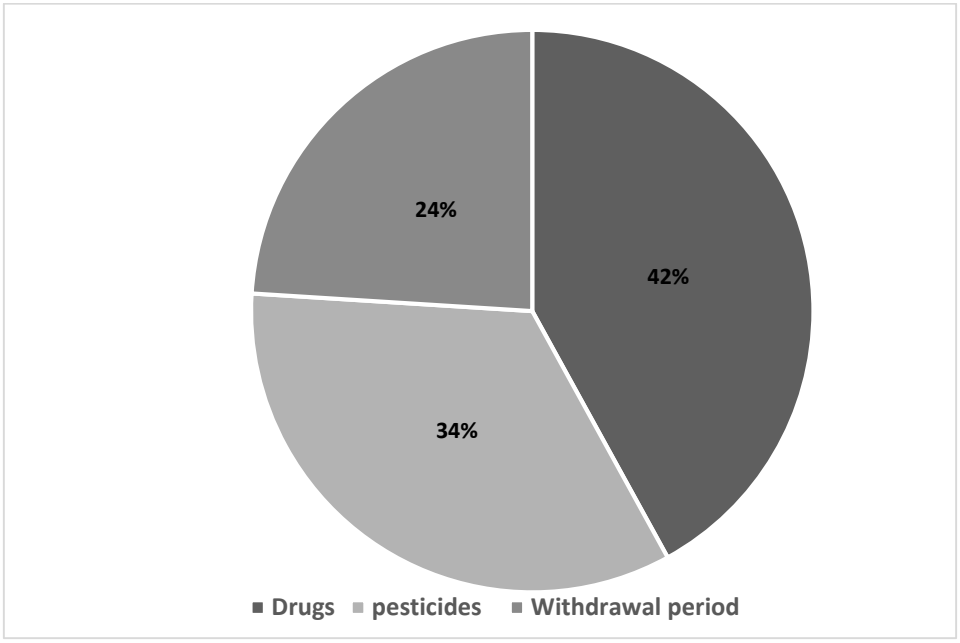
Figure (21) shows that 60% 0f respondents prescription drug and (40%) the both prescription and follow up.



Source: Researcher Questionnaire Data

Figure (21) the Role of Veterinarian in Using Of Veterinary Drugs

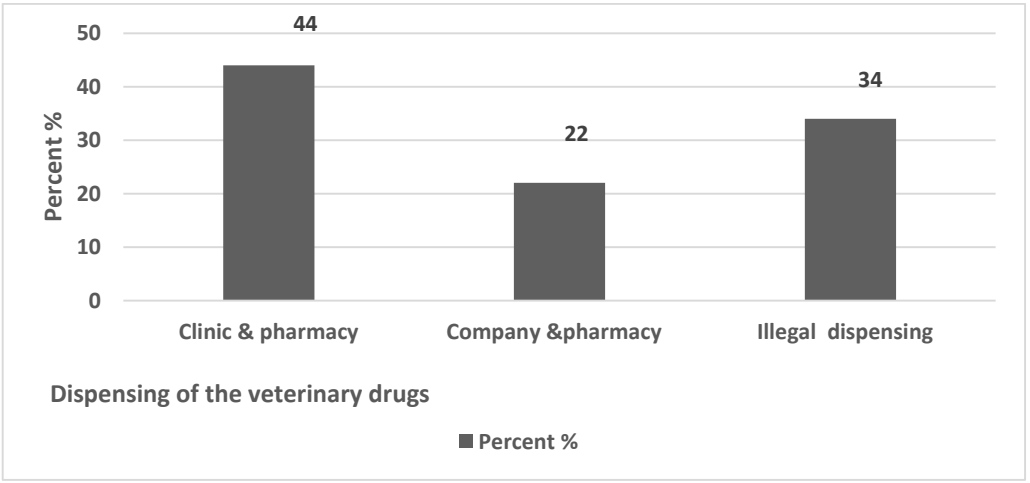
Figure (22) shows that respondents reported chemical residues source in animal product from drugs (42%), pesticides (34%) and (24%) withdrawal period.



Source: Researcher Questionnaire Data

Figure (22) the Main Source of Chemical Residues in Animal Product

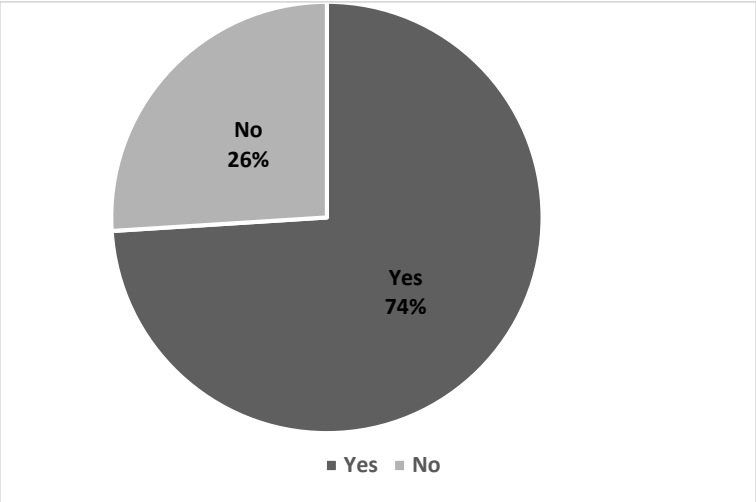
Figure (23) shows that the dispensed of the veterinary drugs (44%) by clinic and pharmacy, (34%) by illegal dispensing and (22%) by clinic and pharmacy.



Source: Researcher Questionnaire Data

Figure (23) Dispensing Of the Veterinary Drugs

Figure (24) shows that the majority of respondents (74%) followed up their cases after treatment, while (26%) of them did not.



Source: Researcher Questionnaire Data

Figure (24): **Following Up the Cases after Treatment**

Table (15) shows that the majority of respondents (62%) not used growth promoter, while (38%) of them used it.

Table (15)

Using Of Growth Promoters By The Farmers		
Item	Frequency	Percent (%)
Yes	19	38
No	31	62
Total	50	100

Source: Researcher Questionnaire Data

Table (16) shows that the majority of respondents 88% explained the veterinary drug residues and their risks to the owner, while 12% did not.

Table (16)

Veterinary Drug Residues And Their Risks To The Owner		
Item	Frequency	Percent (%)
Yes	44	88
No	6	12
Total	50	100

Source: Researcher Questionnaire Data

Table (18) shows that the majority of respondents 82% reported the drugs and pesticides were the major food hazard in their area, while 18% not a major hazard in their area.

Table (18)

Are Drugs And Pesticides Are The Major Food Hazard In Respondents' Area?		
Item	**Frequency**	**Percent (%)**
Yes	**41**	**82**
No	**9**	**18**
Total	**50**	**100**

Source: Researcher Questionnaire Data

Table (19) shows that 66 % of respondents awarded about the hazard of chemicals in food of animal origin, and 34% not awarded.

Table (19)

Awareness About The Hazard Of Chemicals In Food Of Animal Origin In Sudan		
Item	**Frequency**	**Percent (%)**
Yes	**17**	**34**
No	**33**	**66**
Total	**50**	**100**

Source: Researcher Questionnaire Data

Table (20) shows that the majority of respondents 88% were advised the animal owners for the pesticide residues risks, while 12% did not.

Table (20)

Advising The Animal Owners For The Pesticide Residues Risks		
Item	**Frequency**	**Percent (%)**
Yes	**44**	**88**
No	**6**	**12**
Total	**50**	**100**

Source: Researcher Questionnaire Data

Table (21) shows that the majority of respondents 84% of farmers or animal owners did not store drugs in suitable storage condition, while 16% did.

Table (21)

Animal Medicine In Suitable Storage Condition		
Item	**Frequency**	**Percent (%)**
Yes	**8**	**16**
No	**42**	**84**
Total	**50**	**100**

Source: Researcher Questionnaire Data

Table (22) shows the majority of respondents 88% used the drugs to provide a higher return of investment, while 12% did not.

Table (22)

Using Of The Drugs To Provide a Higher Return Of Investment		
Item	**Frequency**	**Percent (%)**
Yes	**44**	**88**
No	**6**	**12**
Total	**50**	**100**

Source: Researcher Questionnaire Data

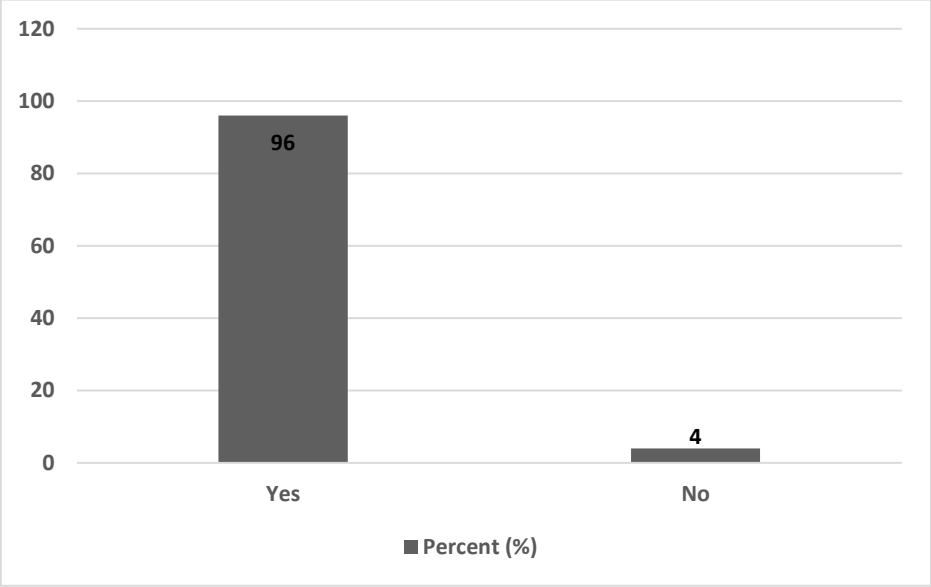
Table (23) show that the majority of respondents 90% reported residues drug levels depended on withdrawal time, and 10% of not depend on withdrawal time.

Table (23)

Residues Drug Levels Depend On Withdrawal Time		
Item	**Frequency**	**Percent (%)**
Yes	**45**	**90**
No	**5**	**10**
Total	**50**	**100**

Source: Researcher Questionnaire Data

Figure (25) shows that the majority of respondents 96% improper dosage of veterinary drug caused public health problems, while 4% did not cause public health problems.



Source: Researcher Questionnaire Data

Figure (25): Improper Dosage of Veterinary Drug Can Cause Public Health Problems

Table (24) shows that 76% of respondents treated their animals by themselves, while 26% did not.

Table (24) Producers Are Treating Their Animals by Themselves

Item	Frequency	Percent (%)
Yes	**37**	**76**
No	**13**	**26**
Total	**50**	**100**

Source: Researcher Questionnaire Data

Table (25) shows that majority of respondents (10%) of veterinarians calculated the doses of the drugs depending on body weight basis, while (90%) did not.

Table (25)

Veterinarians Calculate The Doses Of The Drugs		
Item	**Frequency**	**Percent (%)**
Yes	**5**	**10**
No	**45**	**90**
Total	**50**	**100**

Source: Researcher Questionnaire Data

Table (26) shows that 60% of respondents followed up the cases after prescribing the treatment, while 40% did not.

Table (26)

Following Up The Cases After Prescribing The Treatment		
Item	**Frequency**	**Percent (%)**
Yes	**30**	**60**
No	**20**	**40**
Total	**50**	**100**

Source: Researcher Questionnaire Data

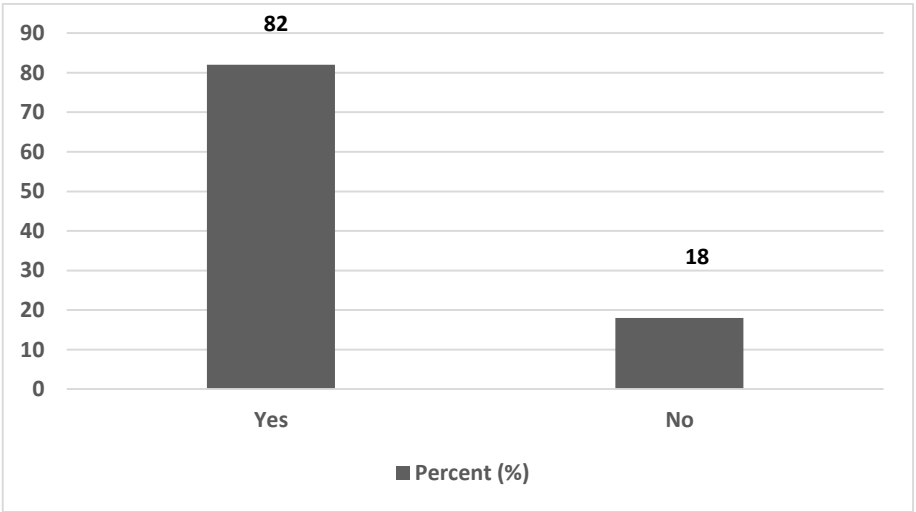
Table (27) shows that the majority of respondents (94%) had limited information about veterinary drug residues, while (6%) had.

Table (27)

Information Are Limited About Veterinary Drugs Residues		
Item	Frequency	Percent (%)
Yes	**47**	**94**
No	**3**	**6**
Total	**50**	**100**

Source: Researcher Questionnaire Data

Figure (26) shows that 82% of respondents records were assisting to ensure that animal products are safe and free from residues, while (18%) said that the records were not assist to ensure the safety and free of residues of animal products.



Source: Researcher Questionnaire Data

Figure (26): Records Importance of Records

Table (28) shows that The majority of respondents 98% reported chemical residues in food of animal origin affected public health and an international trade.

Table (28)

Chemical Residues Affect The Public Health And An International Trade		
Item	**Frequency**	**Percent (%)**
Yes	**49**	**98**
No	**9**	**2**
Total	**50**	**100**

Source: Researcher Questionnaire Data

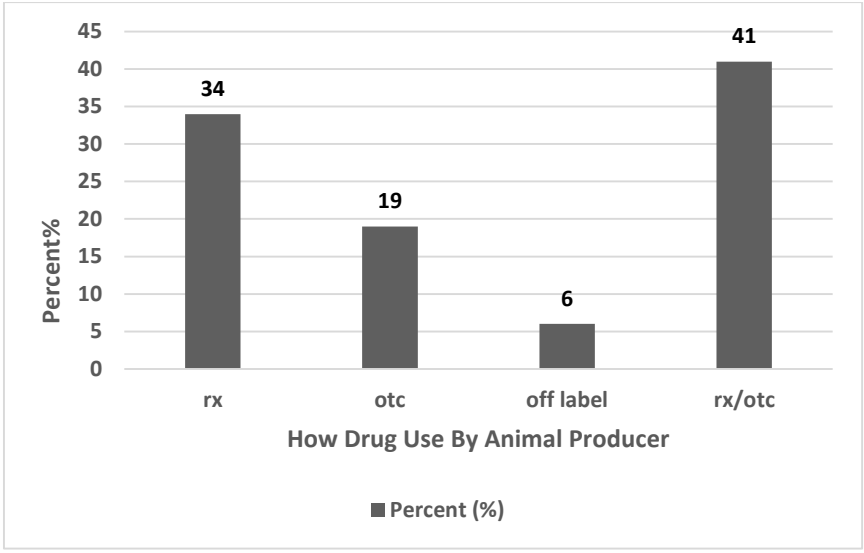
Table (29) shows that (76%) of respondents there was no government policies about controlling veterinary drug residues.

Table (29)

Awareness About Government Policies		
Item	Frequency	Percent (%)
Yes	**12**	**24**
No	**38**	**76**
Total	**50**	**100**

Source: Researcher Questionnaire Data

Figure (27) shows that 41% of used drug by prescription or over the counter, (34%) prescription only, (19%) over the counter and (6%) off label.



Source: Researcher Questionnaire Data

Figure (27): **How Drug Use by Animal Producer**

Chapter Four

Discussion

Discussion

In this study, survey questionnaire was conducted containing question that reflect the real situation of chemical residues .One important observation of this study was the management of the farms which was directed by alliterated owner (19%) (Figure 1) this result agreement with (Almofti. *et al*., 2016) (85%) alliterated or did not complete their education.

In this study reported (34%) had no awareness about the Hazard of Chemicals in Food of Animal Origin (table19) So, there a clear relationship between low education and knowledge of farmer towards drugs and pesticides residues in animal products, agreement with (Mdegela.*et al*., 2021) reported that (40%) of Tanzanian small-scale livestock keepers did not know that antimicrobial agents used in animals could pose any risk to human health.

Anthor remarkable finding of this study only (29%) keeping records (table 9), which agreement with (Almofti. *et al*, 2016) that only 20% of visited farm maintain written records.

Farmer in the study area used drugs for treatment when their animals sick (44%) and both treatment and preventive (56%) (figure19).Nearly result with (Mdegela.*et al*., 2009), the primary reasons why farmers use antimicrobials are for sickness prevention (60%), growth promotion (26%) and treatment (14%). Farmers usually use antimicrobials (61%) and they sometimes use other disease prevention techniques such as biosecurity and vaccination (39%).

The study shows that 75% of farmers treated their animals by themselves (table 25) depending on their observation, production dropped 40%, and symptoms of disease (60%) (figure20), this result agreement with (Katakweba. *et al*., 2012) that about (70%) of owners give the drugs to their animal by their selves, so most of the animal owners did not understand the information given by drug dispensers or were not able to read and understand the information written on the drug labels/leaflets in English. For this reason, some breeders use the colour of drugs to identify drugs. Also agreement with (Wahab Alla. *et al*.,2011) most of the

owner did not consult veterinarian 88% and with (Mdegela.et al.,2021) reported Farmers buy antimicrobial agents to treat animals without the prescription of animal health experts, and drugs management is characterized by incorrect dosages, misuse, incorrect applications and non-adherence to withdrawal periods. Most important in this study investigated the common diseases pneumonia (23%) and mastitis in dairy farm (14%), Pneumonia and Foot Rot (8%), Bloat (31%), Abortion 9%,Tick born disease (5%),thileria (5%) and Brucellosis 5%.(table 5-1) Agreement with (Almofti. *et al*.,2016) Pneumonia 79% , and enteritis 53% ,Foot Rot(41%) .

Study reported Tetracycline as most commonly used drug in the farm (79%) (31%) used Penicillin ,and 8% used Gentamycin (Figure 8), Agreement with (Almofti.*et al*., 2016) reported Penicillin and Tetracycline drugs (83% and 78% respectively) were most preferred drugs for the treatment of diseases in the farm Which indicated absence of diagnostic methods in clinics and veterinary pharmacies and they only depended on tentative diagnosis. agreement with (Mitchell. *et al*., 1997) a survey of all violative carcasses in the United States in 1993 revealed that the drugs most frequently causing residues were penicillin (20%), Tetracycline 4% and Gentamycin (4%).

90% of veterinarians reported that residues drug levels depended on withdrawal time (Table 23), these result are nearly the same as the results of (Fangama. *et al*., 2019) (60%) of veterinarians give tips to the owners about the withdrawal period. By (Mdegela.*et al*., 2021). Animals bought for slaughter from the auction markets were stabilised with antibiotics during trucking to their destination. Animals are injected with oxytetracycline (OTC) in order after the application of this drug, withdrawal periods were not observed at all.

Majority of respondents 90% of veterinarians not calculate the doses of the drugs depending on body weight basis (table 25) which may lead to over-dosing or sub-dosing, and Antimicrobial resistances or toxicity for consumers and animals, and (40%) they were not following up cases after leaving the clinic or pharmacy (table 26). In agreement with (Wahab Alla .*et al*.,2011) survey in Khartoum

revealed that veterinarian did not restrict to the weight of animal when describing doses 76% and there was 86% no following up of cases after leaving the clinic or pharmacy.

Also (60%) of farmer have not awareness about Knowledge of Veterinary Drug Residues and they slaughtered their animals during treatment or before completing withdrawal period (table12) they did not care, they look at profit, same finding was reported by (Daoud and Tigany, 2010) result who reported that when cattle's yards far from centre of city, the owners bought drugs and administrated in emergencies and sometimes slaughter their animals during treatment with antibiotics (32%) or before completing withdrawal period (66%) (41%) they used drug by prescription or over the counter, (34%) prescription only,When livestock keepers in the study area were asked if they knew any possible effects on human health from the use of chemicals in animals, 86% (table19) nearly of result by (Katakweba. *et al*.,2012) (60%) that there were possible effects when animal products from animals treated with antibiotics were consumed.and 84% they did not keep the drugs according to veterinarian advising in suitable condition (Table 21), this chemical residues affect the public health and an international trade 98% ,this due to absent of government policies about controlling veterinary drug residues (table 28,29), 88% were used the drugs to provide a higher return of investment (table 22), . The main source of chemical residues may be present in animal product after treatment with a drug (42%), pesticides (34%) and withdrawal period 24% if they milked or sent to slaughter before the drug has been metabolized and adequately cleared from its system to help ensure the safety of the human food supply and from pesticides (Figure 22). (74%) of owners followed up the cases after prescribing the treatment (figure 24) and 60% of veterinarian followed up the cases after prescribing the treatment (Table 26) agreement with (Fangama. *et al*.,2019) 92% of drugs administration follow up is done by the owners , and 8% of veterinarian continue the treatment their self .

This explained the high percentage of drugs residues in animal's products during questionnaire data collection which may lead to public health hazard in Sudan.

Conclusion and Recommendation

Conclusion

Our survey revealed that there is a general lack of awareness and misusing of veterinary drugs and pesticides. The widespread misuse and improper drug dispensing and handling practices was observed can affect the drug quality and can also contribute to the drug residues and public awareness of the drug residue problem in food is high and still an important concern today to control this problem, ,The lack of knowledge on prudent use of veterinary drugs and pesticides residues in our country this could be due to low level of education of the respondents as majority of them had primary and secondary school education. And uneducated There is a need for better information to them on how, when and why to use drugs. Further, regulation on drugs use and prescription needs to be improved, and age also plays a role and as regards to knowledge of chemical residues. Respondents who have gone on to higher education are also more likely to have a better knowledge of the effects of drugs. The most important factors that may contribute to drugs residues problems in Sudan, lack of regulation and policies in uses of drugs for animal, lack of surveillance of drugs use and residues , lack of updated drugs use and treatment guidelines, Based on the current study, lack of basic knowledge on the concept of drugs residues among farmers. The remaining veterinary drugs were supplied without any prescription and were dispensed by untrained personnel. Furthermore farmers without consulting veterinarians changed the drugs once they thought that the former ones used were not effective.

RECOMMENDATIONS

Veterinarians must be well aware of the importance of drug/chemical residues in the food animals and their possible risk to the general public. They must have updated information about the proper withdrawal times of all the drugs/chemicals used in their areas of practice. They must extend this information to the livestock farmers for the production of residue free edible animal products (milk, meat). For residue analysis, trained manpower are needed. In this regard, the availability

of sensitive equipment and modern analytical techniques and we must have government policies to controlling veterinary drug residues. The responsibility for residue control and prevention must be shared by the government, producers, veterinarians, teachers and academicians, marketing associations, and other interested parties, who must strive for both healthy and efficiently grown animals as well as a safe food supply Several approaches can be taken to achieve this goal.Prescription, delivery and record keeping of drugs used in livestock should be under the care of the prescribing veterinarian, also education and good communication measures through advisory services have been used by health professionals to communicate this issue of drugs residues. For policymakers should stress those Use of drugs for economic purposes such as growth promotion or feed efficiency should be discouraged. Drugs should be administered to animals only when prescribed by a veterinarian and improved surveillance and national regulation is needed to ensure that drugs are used prudently.

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