بسم الله الرحمن الرحيم

Sudan University of Science and Technology
College of Graduate Studies

Risk Assessment of Exportation and Importation of Animals and Animal Products in Khartoum Airport

تقيم مخاطر تصدير وإستيراد الحيوانات والمنتجات الحيوانية في مطار الخرطوم

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إستهلال

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بسم الله الرحمن الرحيم

﴿ ٱلرَّحۡمَٰنُ ۝١ عَلَّمَ ٱلۡقُرۡءَانَ ۝٢ خَلَقَ ٱلۡإِنسَٰنَ ۝٣ عَلَّمَهُ ٱلۡبَيَانَ ۝٤ ﴾

سورة الرحمن

﴿ ٱقۡرَأۡ بِٱسۡمِ رَبِّكَ ٱلَّذِي خَلَقَ ۝١ خَلَقَ ٱلۡإِنسَٰنَ مِنۡ عَلَقٍ ۝٢ ٱقۡرَأۡ وَرَبُّكَ ٱلۡأَكۡرَمُ ۝٣ ٱلَّذِي عَلَّمَ بِٱلۡقَلَمِ ۝٤ عَلَّمَ ٱلۡإِنسَٰنَ مَا لَمۡ يَعۡلَمۡ ۝٥ ﴾

سورة العلق

صدق الله العظيم

DEDICATION

This work is dedicated to

my family

and to all my friends

with my deeply love

Acknowledgement

First, thank to Allah for giving me the health and strength to complete this work.

My deepest gratitude to my supervisor Professors: AMEL OMER BAKHIET, for her guidance, encouragement and help which made this work possible.

A great thank for my colleagues and respondents in the quarantine at Khartoum International Airport (KIAPVQ) for their unlimited co operation.

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ABSTRACT

This study aimed at assessing the knowledge, behavior and practice of employees in supervising the shipment and trans-shipment of animals and their products at Khartoum International Airport. The study adopted the descriptive method. The data were collected by one tool: a questionnaire. A sample of 63 of workers whose work requires direct contact with animals and their products was randomly selected from the Veterinary Quarantine Department; Twenty veterinarians (20) and 43 labours of shipping, unloading and trans-shipments in Sudan Air Cargo village. The data were analyzed by (SPPS) program. The study showed the following results: Despite the sensitivity and great impact of the workplace, workers' knowledge of the most important standards and international regulations governing labour is very weak, there is a clear reluctance on the part of workers to take advantage of modern technology to renew and update their information in the field of employment with recent changes in the field of work and clear weakness in the training and qualification policy for these workers. The study came up with the following recommendations: Review the training policy to conform to the business requirements and enable employees to familiarize themselves with all relevant laws and legislations, educate employees on the importance of public and personal hygiene with the provision of mechanisms and assistive devices.

المستخلص

هدفت هذه الدراسة إلى تقييم معرفة وسلوك وممارسة العاملين في الإشراف على شحن وإعادة شحن الحيوانات ومنتجاتها فى مطار الخرطوم الدولي . وإتبعت الدراسة المنهج الوصفي . وقد تم جمع البيانات بواسطة أداه واحدة وهي إستبانة . تم إختيار العينة عشوائياً من 63 عاملاً الذين يتطلب عملهم الإحتكاك المباشر بالحيوانات ومنتجاتها ويتكونوا من 20 طبيباً بيطرياً بالمحجر البيطري و43 عينة من العاملين على الشحن والتفريغ وإعادة الشحن بقرية سودانير للشحن الجوي . تم تحليل البيانات بإستخدام برنامج النظم الإحصائية للعلوم الإجتماعية (SPSS) . وأظهرت الدراسة النتائج التالية: وعلي الرغم من حساسية مكان العمل وتاثيره الكبير ، فإن معرفه العمال بأهم المعايير والأنظمه الدولية التي تحكم العمالة ضعيفه جداً ، وهناك عزوف واضح من جانب العمال من الإستفادة من التكنولوجيا الحديثة لتجديد وتحديث المعلومات الخاصة بهم في مجال التوظيف مع التغييرات الاخيره في مجال العمل وضعف واضح في سياسة التدريب والتاهيل لهؤلاء العمال.وقد خرجت الدراسة بالتوصيات التالية:مراجعة سياسة التدريب بحيث تتوافق مع متطلبات العمل وتمكن العاملين من الالمام بكل القوانين والتشريعات ذات الصلة، تثقيف الموظفين بشان اهميه النظافة العامة والشخصية مع توفير الاليات والادوات المساعدة.

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INTRODUCTION

Livestock is one of the most important sources of national income in the Sudan. The Sudan is one of the largest livestock-owning countries and the majority of the population depends directly on the farming and grazing profession by working in agriculture and livestock or indirectly by working in sector-related occupations. Following the accession of the Sudan to the World Trade Organization, the expectation of an increase in international trade and a rise in the maritime, air and land ports, the measures should be examined international legislation and specifications to avoid many of the risks associated with international trade, particularly the field of livestock and the risks The movement of animals and its impact on human and animal Health and food safety and its reflection on the environment and economic security. Livestock Production that is the largest single sector within traditional rain fed areas. Animal resources are estimated at 141 million heads including cattle, sheep, goats and camels. Livestock accounts for 17% of Sudan's GDP and 47% of the agricultural production as the profession and mainstay of more than 15% of the country's population (Ramcharan, 2002).

The airplane is one of the most important means of transportation where it is a safe and fast way to reduce time and effort. By using air transport, new markets can be opened away from production areas, and on the other hand, air transport can be used to exchange and improve breeds between countries. Although it is a safe and fast way but it involves many risks which include risks to the safety of the animal itself, risks to the carrier and risks on the environment as a rapid means of transmission of Trans boundary animal

disease such as avian influenza and mad cow, which in turn affects the economy of countries dependent on animal wealth as it affects human health.

WSN (2017) World scientific news mentioned that, although the risk of in-flight transmission of infectious diseases does not seem to be a burning problem of the public health, the fact that the air transport definitely helps to spread communicable diseases around the globe is undisputed. 2002-2003 SARS outbreak, 2009 influenza A/H1N1 pandemic and finally 2012 MERS outbreak showed that the worldwide airline network can play a major role in spreading new, highly infectious diseases and can contribute to a pandemic outbreak in the future. Therefore, it is important to keep international guidelines up-to-date, including IATA (International Air Transport Association) emergency response plans and action checklist for carriers, (IATA (2009) and ICAO (2017)) Standards and recommended practices of relevance to the article 14 of the Chicago Convention in alignment with WHO (International Health Regulations) (ICAO 2017).

Jay (1986) explained that, for national public health safety, there should be a follow up of food product from its first step of production till the final product for hygiene, and that what is called Hazard Analysis Critical Control points (HACCP) concept can be helpful to maintain high standards of slaughter and dressing hygiene based on an assessment of the risks to human and animals health (FAO, 2004). In Sudan, the studies of Risk Assessment of Exportation and Importation Animals and Animal products are very few, so that they need additional research. This study will follow up workers whom direct contact with animals and animal's products in Khartoum Air port.

The dependence of many Sudanese on occupations related to the livestock and agriculture sector gave the sector the utmost importance not only of economic and health importance but of its impact on the social and cultural fabric of the country. The study was aimed to determine, evaluate and manage the risks associated with the transboundary movement of animals and the presentation of international regulations and legislation and compares them with the outcome of the result those followed in the case study.

General objectives:

The study considers the preservation of livestock from external threats as a preserve of national security and its strong attachment to the economic stability of the Sudan.

Specific objectives:

To avoid the risks of airborne transmission and comparison of the standards used in the Sudan for the purpose of trying to reach international standards.

CHAPTER ONE

LITERATURE REVIEW

1.1. Risk idea:

Risk can be defined as likelihood of the occurrence and the magnitude of the consequences of an adverse event, a measure of probability of harm and the severity of impact of hazard (thing or action that can cause adverse effects, e.g.: disease agent that causes an animal disease.). The Sanitary and Phytosanitary (SPS) Agreement, part of the 1994 accords that were established by the World Trade Organization (WTO), promotes international trade by requiring countries to base their sanitary (human and animal safety) and phytosanitary (plant safety) measures on international standards. However, it allows countries wide latitudes to deviate from international standards when choosing their level of SPS protection, provided that:

(i) countries base their deviations on scientific risk assessment,

(ii) countries avoid discrimination by requiring comparable levels of SPS protection in comparable situations, and

(iii) Countries not implement SPS measures that are more restrictive of trade than necessary to achieve the level of SPS protection that they seek (Victor, 2012).

1.2. Risk Analysis in OIE:

The international standards of OIE are the preferred choice of disease control measures for risk management. However, there may be occasions when the analysis leads to the conclusion that the measures outlined in the code are insufficient to meet the appropriate level of protection for the importing country. In these circumstances, other measures may be formulated, in such instances. Managing risk to an acceptable level will also require the expertise of a veterinary epidemiologist. The role of the OIE with respect to the Agreement on the Application of Sanitary and Phytosanitary Measures (the so-called SPS Agreement) of the World Trade Organization (WTO) provides definitions and describes the OIE informal procedure for dispute mediation and objective and defensible risk analyses for international trade. The components of risk analysis described are hazard identification, risk assessment, risk management and risk communication (OIE, 2012).

1.3. Hazard Identification:

The hazard identification involves identifying the pathogenic agents which could potentially produce adverse consequences associated with the importation of a commodity. It is then necessary to identify whether each potential hazard is already present in the importing country,

and whether it is a notifiable disease or is subject to control or eradication in that country and to ensure that import measures are not more trade restrictive than those applied within the country. Hazard identification is a categorization step, identifying biological agents dichotomously as potential hazards or not. The risk assessment may be concluded if hazard identification fails to identify potential hazards associated with the importation (OIE, 2012).

1.3. Risk Assessment:

Risk assessment should be flexible to deal with the complexity of real live situations. No single method is applicable in all cases, the risk assessment include three steps Release assessment, Exposure assessment and Consequence assessment after these steps of risk estimation, Therefore risk estimation consists of integrating the results from the three risk steps to produce overall measures of risks associated with the hazards identified at the outset (OIE, 2012).

1.4. Risk Management

1.5.1. Principles of Risk Management:

The OIE defined the risk management as a process of deciding upon and implementing measures to achieve the Member's appropriate level of protection (MALP), whilst at the same time ensuring that negative effects on trade are minimized. The aim is to manage risk properly to ensure that a balance is achieved between a country's desire to minimize

the probability or frequency of disease incursions and their consequences and its desire to import commodities and fulfill its obligations under international trade agreements. The international standards of the OIE are the preferred choice of sanitary measures for risk management. The application of these sanitary measures should be in accordance with the intentions in the standards of OIE (OIE, 2012).

1.5.2. Risk Management steps:

In brief the risk steps or components can be summarized into (i) Risk evaluation (ii) Option evaluation (iii) Implementation (iv) Monitoring and review (OIE, 2012).

1.5.3. Risk Communication:

The participants in the risk communication process are all the potentially affected and interested parties (stakeholders), including the Veterinary Administrations in the countries. All stakeholders need to acknowledge and provide a reasoned argument that is relevant to the risk analysis and management (OIE, 2003).

1.6. Relationship between Risk Assessors and Risk Managers:

A close relationship between the risk assessors and risk managers is essential as there must be a rational relationship between the outcome of the risk analysis and the sanitary measures chosen. The risk analysis should precede the

decision, rather than being commissioned to support a decision already made (OIE, 2003).

1.7. The Global Early Warning and Response System for Major Animal Diseases including Zoonosis (GLEWS)

The Global Early Warning and Response System (GLEWS) is a joint system that builds on the added value of combining and coordinating the alert and response mechanisms of OIE, FAO and WHO for the international community and stakeholders to assist in prediction, prevention and control of animal disease threats, including zoonosis, through sharing of information, epidemiological analysis and joint field missions to assess and control the outbreak, whenever needed.

Joint (FAO, OIE and WHO) initiative which combines the strengths of the three organizations to achieve common objectives. Through sharing of information on animal disease outbreaks and epidemiological analysis the GLEWS initiative aims at improving global early warning as well as transparency among countries.

1.8. OIE's Approach:

The complexity of disease emergencies in a globalised world calls for the identification of effective strategies, based on both science and proven practical experience, to reduce future threats. The H5N1 avian influenza crisis has shown

how crucial it is to address persistent global threats at the interface between humans, animals, and ecosystems. Moreover, it has shown how a concrete, transparent and consistent approach, based on high-quality scientific advice and practical .experience, is vital for the management of these threats and for political credibility, both at the national and international level (OIE, 2012).

1.9. World Trade Organization:

WHO will continue to track evolving infectious diseases, sound the alarm when needed, share expertise, and mount the kind of response necessary to protect human populations from the consequences of epidemics, whatever and wherever their origin might be.

1.10. Biosecurity:

Biosecurity is the term used to describe a program for the prevention and control of infectious disease. The plan should include practices that reduce the likelihood of introducing a new disease from external sources, and reduce the spread of infectious disease if introduced (Dargatz *et al*. 2002).

Biosecurity is defined as the outcome of all activities undertaken by an entity to preclude the introduction of disease agents into an area that one is trying to protect (Dargatz *et al*. 2002), biosecurity means that, if you work or come into contact with farm animals, you must make sure that good hygiene practices are in place. This will help

prevent the spread of animal disease. Good biosecurity is a vital part of keeping disease away from animals. It also helps to improve farm efficiency, protect neighboring farms and the countryside. Infectious disease agents found in animal populations and animal products are a considerable and are an on-going threat to animal health, food safety, and public health. The most effective and sustainable way to protect against threats from deliberate and accidental releases of animal pathogens is to strengthen existing systems for rapid response, and for biosafety and biosecurity, whilst fostering scientific networks that work towards altruistic goals. This approach has multiple collateral benefits for animal health, agriculture, public health, poverty alleviation, animal welfare, and economies (OIE, 2012).

1.11. Animal and Zoonotic Disease:

Veterinarians are trained to recognize disease. Diseases of great interest to them are zoonoses, which are diseases that can affect both animals and man (Barry and Richard 2011**).**

Live animal carry microorganisms on the skin, hair and in the cavities of organs which communicate with the exterior through the natural opening **(**Sariy Eldin, 1972).

Frazier and Westhoff (1995) obtained that the sources of microorganisms from animals including flora, the flora of the respiratory tract, and the flora of the gastro intestinal tract. The natural surface flora of meat animals usually is not as

important as the contaminating microorganisms from their intestinal or respiratory tracts. However, hides, hooves, and hair contain not only large numbers of microorganisms from soil, manure, feed and water but also important kinds of spoilage organisms.

1.12. Food safety:

Inadequate hygiene training and / or instruction and supervision of all people invalid in food related activities pose a potential threat to the safety of food and its suitability for consumption **(**FAO and WHO, 2001).

FAO and WHO (2001) required that people who do not maintain an appropriate degree of personal cleanliness, who have certain ill nesses or conditions who behave in appropriately, can contaminate food and transmit illness to consumers.

All operations and practices should be carried out in a manner that limits contamination to as low level as possible. Good personal hygiene and adequate training programs are important components, to ensure compliance with operational requirements (FAO and WHO 1993).

FAO and WHO (1993) stated that the application of HACCP systems can aid inspection by regulatory authorities and promote international trade by increasing confidence in food safety.

1.13. Food-borne diseases:

About 75% of the new communicable diseases that have affected humans over the last 10 years were caused by pathogens originating from animals or animal products (WHO, 2007). Zoonotic pathogens are a major contributor to human food-borne diseases in both developed and developing countries (Schlundt, 2002). They are transmitted during handling of infected livestock at the farm, markets, slaughterhouse, processing and transportation, at the butchery or during preparation of food (Hubbert, 1996). In many countries and especially in developing ones, millions of people are affected by preventable zoonoses such as Rabies, Rift Valley Fever, Brucellosis, Leishmaniasis, Echinococosis, Tularemia, amongst others (WHO, 2002). The burden of zoonoses falls disproportionately on poor rural communities which have poor sanitary living conditions and low education that are considered as potential risk factors in many developing countries (Perry *et al*., 2002). As the level of awareness of food-borne zoonoses pathogens grow, demand for safer livestock and their products will increase from consumers locally and internationally (Correa and Gerster 2003).

1.14. Knowledge, attitudes and practices (KAP):

The relationship between knowledge, attitudes and practices is often explained. It has been traditionally assumed that knowledge is automatically translated into behavior (Glanz *et*

al., 2002). Knowledge accumulates through learning processes and these may be formal or informal instruction, personal experience and experiential sharing (Tracy, 2011). Knowledge however is not insignificant and it is found to be vital in the cognitive processing of information in the attitude-behavior relationship. Attitudes involves evaluated concepts associated with the way people think, feel and behave, it comprises a cognitive, emotional and a behavioral component implying of knowing, feeling and doing (Keller, 2007). In health related studies, however, it has been found that knowledge is not the only factor that influences treatment seeking practice and in order to change behavior, health programs need to address a number of issues including socio-cultural, environmental, economical and structural factors (Tracy, 2011). Behaviorists further added that a number of factors can influence one or more of the KAP variables such as self-esteem, self-efficacy and misconception.

In 2006 the world Health Organization (WHO) introduced simpler, more generally applicable and essential food safety messages or principles linked to behaviors. If adopted and practiced, these messages will reduce the probability of food borne illness. The core messages of the five keys to safer food are (1) keep clean; (2) separate row and cooked; (3) cook thoroughly; (4) keep food at safe temperatures; and (5) use safe water and raw materials.

1.15. Tran's boundary animal disease:

Trans boundary animal diseases (TADs) are defined as animal diseases" of significant economic, trade and/or food security importance for a considerable number of countries; which can easily spread to other countries and reach epidemic proportions; and where control/ management, including exclusion, requires cooperation between several countries" (FAO, 1997). The prevention and control of TADs is expected to have a positive impact on food security, thereby contributing to the Millennium Development Goals. There is no fixed or exhaustive list of TADs. At the time of writing, animal health experts in FAO provided lists of TADs considered important, and a still longer list was available in Chapter 2 of the Terrestrial Animal Health Code of the World Animal Health Organization (OIE). One reason why the list is not fixed is that diseases that were previously unknown or considered unimportant can, nevertheless, enter a livestock population, spread and cause damage. These are known as "emerging" infectious diseases. Another reason is that the description of a TAD allows for some ambiguity and misinterpretation. It includes three elements.

(a) Significant impact for a number of countries;

(b) Rapid spread, including across borders, and

(c) The need for regional or international cooperation. Some diseases, although important, are clearly not TADs; an

example is anthrax. The critical distinguishing feature of the TAD is point (b), the ability to spread rapidly and cross borders. This potential for rapid spread creates the sense of urgency by which people instinctively recognize a TAD. It is also the reason why regional or international initiatives are always considered to be necessary for the prevention and control of TADs.

1.16. Economic impact of a TAD:

The economic impact of a TAD can be assessed at different levels and from the perspectives of different stakeholders. For example: Onal government or a regional coalition, it may represent a threat to national income, a potential drain on budget, and an impediment to international trade.

• For livestock producers, traders, and the processors and retailers of livestock products, the presence of a TAD may represent a threat to livelihood, a need to invest in prevention measures, and a source of friction with state veterinary services.

• Animal health providers and the suppliers of vaccines and drugs may see a TAD as a source of revenue from drug and vaccine sales.

• Consumers may perceive a TAD as a threat to health (if the disease is zoonotic), and may be disadvantaged if a severe disease outbreak affects food prices or disrupts the food supply.

• The presence of a TAD can reduce revenue from tourism if it restricts access to rural areas or discourages people from visiting an infected country.

There are four main sources of impact. The first three are experienced within the livestock sector, namely:

• Disease effects: the mortality and loss of production caused by clinical or subclinical disease.

• Market disruption: as a result of consumer fears, or supply shortage causing market shocks, or as a consequence of restrictions on international trade in livestock and livestock products that are applied because of TADs.

• Control measures: the costs and benefits of measures applied by farmers, governments and industry to prevent or control disease outbreaks. In addition to effects within the livestock sector, there is also a fourth source of impact:

• Effects beyond the livestock sector: these may include impacts on human health, the public health system, tourism and wildlife. In developed countries, TADs hardly ever occur without control measures being applied or markets affected, and in these countries the main economic impact often results not from the disease itself but from market disruption and costs of disease control (FAO. 2016).

1.16.1. Motivation for stakeholders to comply with TAD control regulations:

Veterinary services sometimes appear surprised when farmers or livestock traders fail to report suspected cases of a TAD, or prolong outbreaks by selling infected animals or failing to observe basic biosecurity measures. Outbreak investigations uncover risky practices by drivers of milk tankers and feed lorries who fail to clean their vehicles, and animal health practitioners who move from farm to farm without washing their footwear, or use the same needle to vaccinate more than one animal. Surveys of livestock markets reveal practices that allow viruses to spread between animals and from animals to people. Consumers practice poor kitchen hygiene or import unprocessed meat from places where TADs are common.

Even when regulations are in place to minimize the spread of TADs, they are often ignored or improperly implemented. This is a source of frustration to governments, and reduces the effectiveness and economic viability of prevention and control programmers. Estimates of economic viability are based on assumptions about the way things will happen. To provide a useful analysis the assumptions need to be credible Options to diversify and protect against TADs risks (FAO. 2016).

1.16.2. Market disruption:

Market disruption is a component of the economic impact of TADs. It takes two forms, each with economic consequences, namely market shocks and export market restrictions.

1.16.2.1. Market shocks:

If consumers fear that animal products or exposure in markets will make them ill, this can lead to a sharp fall in consumption of certain livestock products when an outbreak of a TAD is announced. The fall in demand results in a fall in prices and loss of revenue for producers until consumer confidence is restored.

Zoonotic diseases, whether transboundary or not, often cause this type of shock. Poor risk communication may exacerbate demand shock from a zoonotic disease, with exaggerated media messages heightening consumer reactions. H5N1 highly pathogenic avian influenza (HPAI) resulted in market shocks related in many countries arising from consumer fears of contracting the disease from poultry meat.

1.16.2.2. Trade restrictions in export markets:

A ‘notifiable’ disease is a disease that is required by law to be reported to government authorities and one which a government is obliged to report to the OIE under the

agreement on sanitary and phytosanitary regulations (SPS agreement) of the World Trade Organization (WTO). Most TADs are classified by the OIE as notifiable diseases and as such they can constitute the reason to limit or ban imports of livestock and livestock products under the SPS agreement. According to this agreement a country is entitled to restrict imports of livestock products in order to minimize the risk of transmitting TADs to its own livestock population.

TAD epidemic involving several countries in trade restrictions can create an international market shock, although this usually only occurs for a short period as global livestock markets adjust very rapidly to supply disruption. Disruption can be more severe if outbreaks occur in more than one major exporting country, or if outbreaks of TADs affecting different species occur in rapid succession.

Trade restrictions can potentially work against importing countries in the event that a TAD outbreak affects the domestic supply of a widely-consumed food product at a time when there are restrictions on the import of livestock products. The only example in recent history was for a short period during a protracted HPAI epidemic in Egypt, when import bans on poultry products were in place to protect the domestic livestock sector (FAO. 2016).

1.16.3. Human health:

Tran's boundary animal diseases can have direct and indirect impacts on human health. Direct impacts occur when humans are infected by zoonotic TADs (those that are naturally transmitted between vertebrate animals and humans), and become ill. Indirect effects can occur if the presence of TADs severely disrupts the food supply or the ability of poor families to access food. Zoonotic TADs can have economic impacts if they cause mortality in people, or through illness prevent them from doing the things that they would normally do, or oblige them to require medical treatment. Brucellosis, certain strains of AI, rabies, West Nile fever and Rift Valley fever are all examples of zoonotic TADs. The first two have economic impacts within the livestock sector and in human health. The last three are primarily diseases of humans, with wildlife and/or domestic animals involved in transmission; neither the disease nor the control process has any notable economic effect in livestock.

1.16.4. Sanitary safety:

Safeguard world trade by publishing health standards for international trade in animals and animal products.The OIE develops normative documents relating to rules that Member Countries can use to protect themselves from the introduction of diseases and pathogens, without setting up unjustified sanitary barriers. The main normative works produced by the

OIE are: the Terrestrial Animal Health Code, the Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, the Aquatic Animal Health Code and the Manual of Diagnostic Tests for Aquatic Animals.

OIE standards are recognized by the World Trade Organization as reference international sanitary rules. They are prepared by elected Specialist Commissions and by Working Groups bringing together internationally renowned scientists, most of whom are experts within the network of about 310 Collaborating Centers and Reference Laboratories that also contribute towards the scientific objectives of the OIE. These standards are adopted by the World Assembly of Delegates (OIE, 2018).

Tables (1-4) showing exported and imported animals and animal products between January – October -2018:

Table (1): Exported animal products January – October 2018:

Product	Leather	Chilled meat/ TON	Chilled fish/ TON	Production waste/TON	Frozen /chicken TON
Quantity	1535923.5DOZ 4536.3TON 82400SQF	111935524.8	543338	12.5	2.350
Revenues	307095547.5$	29250653.25$	607800.8$	1600$	3358.7$

Source: Khartoum Air Port Veterinary Quarantine (KAPVQ), monthly reports January October 2018.

Table (2): Exported animals January – October 2018:

Animal	Wild Rabbit	Wild Turtles	Wild Dab	Wild Falcon	Foxes	Monkey (nsnas)
Number/head	**106**	**1717**	**5675**	**204**	**908**	**205**

Wild cat	Decorative Birds	Cats	Dogs	Race Camel	Sheep	Goat
137	**39**	**32**	**46**	**666**	**1464**	**87**

Rabbits	Monkey	Pigeon	Parrot//Peacock	Deer	Wild Birds	Cow
18	**181**	**120**	**14**	**4**	**30**	**13**
Total revenues for exports animals : 5832400$						

Source: Khartoum Air Port Veterinary Quarantine (KAPVQ), monthly reports January October 2018.

Table (3): Imported animal products January – October 2018:

Feed Concentrates	Freezing Sperm	Feed Additives	Chicks (mothers)	Fertilized Eggs
1471708/ton	18200/sperm	1304914.5/ton	372893/chick	10128117.23/egg

Source: Khartoum Air Port Veterinary Quarantine (KAPVQ), monthly reports January October 2018.

Table (4): Imported animals January – October 2018:

Cats	Dogs	Falcon	Decorative Birds	Improved Goats
21	114	88	18	88

Source: Khartoum Air Port Veterinary Quarantine (KAPVQ), monthly reports January October 2018.

CHAPTER TWO

MATERIALS AND METHODS

2.1. Data collection site:

The data was collected from: (1) Khartoum International Airport (KIAP), KIAP is the main international airport in Sudan which is situated in 15º 35′ 22″ north (latitude) and 32° 33′ 11″ East (longitude) and elevation of 12 55 (386m) about sea level. KIAP is used for both civil and military purposes.

(2) Ministry of Animal Resources, Fisheries and Rangelands, Khartoum Air Port Veterinary Quarantine (KAPVQ), which is responsible for national animal health matters including quarantine, disease control, reporting, import and export certification of animals and their products.

2.2. Questionnaire survey

Data about risk assessment of exportation and importation of animals and animal product in Khartoum Airport were collected by means of a questionnaire from workers whom were in direct contact with animals and animal products in KCV and KIAPVQ.

2.3. Target respondents:

Responses to questionnaire were selected to include veterinarians who were working in the quarantine at

Khartoum International Airport (KIAPVQ) and Khartoum Air Port, Khartoum Cargo Village (KCV) loading and offloading workers. Target respondents are presented in Table (5).

Table (5): Target respondent veterinarians who are working in the quarantine at Khartoum International Airport (KIAPVQ) and Khartoum Air Port, Khartoum Cargo Village (KCV) loading and offloading workers

Unit	**Frequency**	**Percentage**
A- Qualification		
Pre-school	4	6.3
high School	36	57.1
University	16	25.4
Upper university	7	11.1
Total	63	100.0
B- Experience		
< 5 years	3	4.8
5-10 years	6	9.5
>10 years	54	85.7
Sub-**total**	63	100.0
C- Gender		
Female	17	27.0
Male	46	73.0
Total	63	100.0

2.4. Sampling strategies:

Data was collected from non-probability sampling methods based on willingness and support of respondents (that means not all the veterinarians and workers in the study site had the same chance for being selected for responding to the questionnaire.

2.5. Data analysis:

Data related to risk assessment was analyzed by using IBM SPSS statistics version 20-Descriptive statistic such as frequency and percentage was used and presented either in table or bar chart. No analytical statistic was done for data because there was no standard or basic variable for making such analysis as well as some time the required sample size was too low. This method of analysis was selected as statistical descriptive proportion to the small size of the sample under study and the lack of statistical distribution. The sampling is not valid compared to the value calculated and the theoretical value, as in the case of Chi-Square Test descriptive method which relies on the study of fact or phenomenon, as this kind of surveys is the appropriate style to gather information about the problem or what its purpose and the strengths and weaknesses in order to reach conclusions about the validity of this situation to reach partial or radical change.

2.6. Risk management components:

This was classified as described by (OIE, 2012) as follows:-

Risk Management Components:

- Risk evaluation
- Option evaluation
- Implementation
- Monitoring and review.

CHAPTER THREE
RESULTS

Table (6) shows the questionnaire survey responses related to knowledge of risks by workers whom were a direct contact with animals and animal product in airport. Table (6) shows that (57.1%) of workers were holding high secondary education, (65.1%) have no persistent of scientific knowledge in the field of the study. 74.6% of the respondents the internet were considered a basic source of information. Although 93.7% of respondents always had internet access to work, it was found that 65.1% were rarely updated their information and only (20.6%) updated their information each year. The participants in this study showed a medium knowledge about regulations regarding animals and animal products. 57.1% of the respondents know about presence of regulation, and (55.5%) showed between good to excellent level of knowledge about regulation. 57.2% of the participants showed a medium knowledge about signs and symptoms of infectious diseases. 61.9% were between good to excellent level of knowledge about risks. Only (11.1%) of respondents can treat and control the risk and (74.6%) of them can report it. (58.7%) of the respondents had been trained for more than five years or never and (27%) of them received monthly training.

Table (6) the questionnaire survey responses related to knowledge of risks by workers in Khartoum Airport.

Unit	Frequency	Percentage
Persistent of scientific knowledge in the field of research		
No	41	65.1
Yes	22	34.9
Updating of the knowledge		
Always	12	19.0
Sometimes	20	31.7
Nothing	31	49.2
Source of the knowledge References		
Internet	47	74.6
Journals	8	12.7
Nothing	4	6.3
Frequency for updating of the knowledge		
Monthly	9	14.3
Every year	13	20.6
Rarely	41	65.1
Availability of internet at work		
Not exists	4	6.3
Always	59	93.7
Rarely		
Time for last training		
Monthly	17	27.0
Every year	9	14.3
More than 5 years	37	31.7
Nothing	17	27.0

Presence of regulation		
Yes	36	57.1
No	4	6.3
I don't know	23	36.5
Knowledge about regulation		
Excellent	23	36.5
Good	12	19.0
Acceptable	5	7.9
Poor	23	36.5
Knowledge about signs and symptoms of infection disease		
Excellent	25	39.7
Good	11	17.5
Acceptable	3	4.8
Poor	24	38.1
Knowledge about risk		
Excellent	32	50.8
Good	7	11.1
Acceptable	24	38.1
Poor	0	0
Dealing with risk		
Notes for it	47	74.6
Be away	7	11.1
Treated it	7	11.1
Negligent it	2	3.2

Table (7): Attitudes of risks by workers whom with direct contact with animals and animal product in airport:

Table (7) shows that 65.4% to 65.4% of respondents agreed with that Health status of the workers should be evaluated before employment, washing hands before and after work reducing the risk of contamination, eating and drinking in the work increases the risk.

Unit	Frequency	Percentage
Using gloves, lab coat (apron), mask, caps is reducing risk of contamination		
Agree	62	98.4
Disagree	1	1.6
No idea	0	0
Worker who have abrasions or cut on hands should not touch animals or animal products without gloves		
Agree	63	100.0
Disagree	0	0
No idea	0	0
Food hygiene training workers is an important issue in reducing risk of infection disease		
Agree	63	100.0
Disagree	0	0
No idea	0	0
Is it necessary to cheek the temperature of the refrigerator to reduce risk of contamination		
Agree	63	100.0
Disagree	0	0
No idea	0	0
Health status of the workers should be evaluated before employment		
Agree	43	68.3
Disagree	20	31.7
No idea	0	0

Zoonosis disease can have deleterious health and economic effects on the society		
Agree	63	100.0
Disagree	0	0
No idea	0	0
Washing hands before and after work reducing the risk of contamination		
Agree	43	68.3
Disagree	20	31.7
No idea	0	0
Proper cleaning and handling of instrument reduces the risk		
Agree	63	100.0
Disagree	0	0
No idea	0	0
Eating and drinking in the work increases the risk		
Agree	41	65.1
Disagree	21	33.3
No idea	1	1.6
Avoid any contact with animals and animal product reduce the risk		
Agree	62	98.4
Disagree	1	1.6
No idea	0	0

The results in Table (8) illustrate the practices of risks by workers were low which indicate that proper personal hygienic practices are not implemented. The study shows that (80.9%) of the respondents work in export and import animals and animal products in the same time which may increase the risk of contamination, transmission and spread of diseases. 68.3% of the respondents have never any training while 6.3% have sometimes training regarding how to deal with animals and animal products.

Table (8): Practices of risks by workers who were in direct contact with animals and animal product in airport

Unit	Frequency	Percentage
Do you wear apron during work		
Never	36	57.1
Sometimes	9	14.3
Always	4	6.3
Ever	14	22.2
Do you use gloves during work		
Never	37	58.7
Sometimes	9	14.3
Always	3	4.8
Ever	14	22.2
Do you use mask during work		
Never	39	61.9
Sometimes	6	9.5
Always	5	7.9
Ever	13	20.6
Do you wash your hands before using gloves		
Never	36	57.1
Sometimes	5	7.9
Always	2	3.2
Ever	20	31.7
Do you wash your hands after you touch animals or animal products		
Never	8	12.7
Sometimes	22	34.9
Always	1	1.6
Ever	32	50.8
Do you wash your hands after rest time when you come back to work		
Never	1	1.6
Sometimes	1	1.6
Always	7	11.1
Ever	54	85.7

Do you eat or drink in your work		
Never	19	30.2
Sometimes	11	17.5
Always	25	39.7
Ever	8	12.7
Do you smoke in your work		
Never	37	58.7
Sometimes	22	34.9
Always	2	3.2
Ever	2	3.2
Do you work in export and import animals and animal products in the same time		
Never	4	6.3
Sometimes	8	12.7
Always	6	9.5
Ever	45	71.4
Do you use shoes disinfection mat and related poster		
Never	59	93.7
Sometimes	1	1.6
Always	3	4.8
Ever	0	0
In the plane do you use any protocol to prevent the risk of introductions of disease transmitted by insects		
Never	42	66.7
Sometimes	9	14.3
Always	7	11.1
Ever	5	7.9
Do you have any training regarding to how to dealing with animals and animal products		
Never	43	68.3
Sometimes	4	6.3
Always	5	7.9
Ever	11	17.5

CHAPTER FOUR

DISCUSSION

This study was designed to assessmented risk of exportation and importation of animals and animal product. The study focused on the human factor as an important part of risk identification, this study provides information about Knowledge, attitude and practices of risks by workers whom direct contact with animals and animal product in airport regarding to reduce risk. Khartoum International Airport is the major air transport in Sudan, and most of goods export or import pass through it, Khartoum Cargo Village (KCV) is only area where most of the export and import goods are inspect include animals and animals products, so it easy to control. Risk management is based on prevention strategy. The correction of such risks will cause major losses.

The output of this study showed low training level, these finds agree with Marawa, (2013) who studied it at airport quarantine staff. All animal and animals' product released without follow up.

In this study all participants agreed that using personal protective equipment (PPE) and washing hand reduce the risk of contamination and this leading to reduction of transmission of food-borne diseases, and agreed that Workers who have abrasions or cut on hands should not touch animals or animal products without gloves, these findings agree with

Larson, (1996) who explained that hand care is important because intact skin (with no cuts or abrasions) is a natural defiance against infection. Any breaks or lesions of the skin are possible sources of entry for pathogens.

All participants agreed that Food hygiene training workers are an important issue in reducing risk of infection disease, this results is in agreement with the results Abdallah *et al*. (2009) who stated that education of abattoir workers and meat handlers is important that providing wholesome and safe meat for consumers, Zoonosis disease can have deleterious health and economic effects on the society, this agrees with (Jones and Angulo,2006), proper cleaning and handling of instrument reduces the risk, this agreed with Patterson *et al*. (2005). Proper cleaning of environmental surfaces, including work areas and equipment, prevents transmission of zoonotic pathogens. Environmental surfaces and equipment should be cleaned between uses or whenever visibly soiled.

(98.4%) participants agreed that to avoid any contact with animals and animal products reduced the risk, this agrees with Garner (1996) Contact transmission can occur when pathogens from animals or their environments enter the human host through ingestion, mucous membranes, or coetaneous/ percutaneous exposure. Direct contact transmission may occur during activities such as examining, medicating, bathing, and handling animals that increases risk

of exposure to other pathogens through direct and indirect contact.

Australian Veterinary Association, Guidelines for Veterinary Personal Biosecurity has stated that Personnel training and education are essential components of an effective infection control program. All personnel, including temporary personnel, kennel staff, students and volunteers, should receive education and training about injury prevention and infection control during their initial orientation and periodically thereafter. Additional training should be provided as recommendations change or if problems with infection control practices are identified. Training should emphasize awareness of the hazards associated with individual work duties, and prevention of zoonotic disease exposure. Staff participation in training should be documented by the clinic's designated person.

A study to assess knowledge, attitudes, and behavior concerning food-borne diseases and food safety issues amongst formal food handlers conducted in Italy found that the majority of food handlers who had attended a training course had knowledge and positive attitude toward food-borne diseases control and preventive measure. The positive attitude was not supported when asked about self-reported behaviors and when observed during food preparation for practice of hygienic principle. This was on the basis that only 20% used gloves when touching raw, unwrapped food. Predictors of the use of gloves were educational level and

attending training courses. The authors suggested that emphasis should continue on improving knowledge and control of food-borne diseases amongst food handlers (Angelillo *et al*., 2000). In Malawi, a study on the KAP on food hygiene of caregivers also showed a poor relation between knowledge, behavioral and sanitary practices (Tracy, 2011). Also there is disagreement between Khalid (2016) and the prsent results in that respondents knew proper food handling concepts but did not put those concepts into practice. Khalid (2016) believed that the proper use of gloves decrease transfer of pathogens from hands to food, and reported that gloves use may promote poor hand washing practice.

USDA – FSIS (2002) reported that consumers were more Knowledgeable about food safety, but their knowledge was not always reflected in their food handling behavior.

CONCLUSION

The present study concluded that:

1. Despite the sensitivity of the workplace and its great impact, the workers, knowledge of the most important stander and international laws governing the work was very weak.
2. There was a clear reluctance on the part workers to benefit from modern technology in the renewal and updating of their information in the field of work and thus keep abreast of recent changes in the field of work.
3. A significant weakness in the policy of training and rehabilitation of this segment of workers.

RECOMMENDATIONS

1. Education of personnel on the importance of general and personal hygiene " wash hands before start of work, when re-entering work area or after any other situation that will cause the hands to become dirty and became source of contamination or cross contamination. The export abattoir should follow one of the powerful and recent quality control systems to ensure safety such as Hazard Analysis and Critical Control Point (HACCP) system from slaughtering till shipping.
2. Training of personnel or technical staff and instructed them with elements of sanitation and hygiene are needed to reduce the contamination.

3. Prevention of cross-contamination which may occur during many points of the workplace.
4. Proper design of place where animals and animals" produces loading and off loading lines and the adaptation of efficient hygienic methods of transportation animals
5. The means of transport should be clean and if necessary disinfected before loading, Train workers with high training and squire experience in dealing with animals and their products to minimize risks.
6. The equipments which used to carry products must sterilize to avoid contamination and cross contamination.
7. Education of personnel on importance of general and personal hygiene, Wash hands before start of work, and after any situation that will cause the hands to become dirty and to be source of contamination
8. The worker should be wearing the gloves and uniform during the work.
9. The uniforms of workers should be clean at the start of work, and should be changed when they become dirty.
10. Strict hygiene measures in area of work.
11. There workers should be avoid touch hides and skins of animals with their hands to minimize and avoid contamination
12. Development of methods to detect and mitigate contamination to prevent food borne illnesses.

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Appendices

Key words:

Khartoum Air Port Veterinary Quarantine (KAPVQ),

Khartoum Cargo Village (KCV)

Sudan University of Science and Technology

College of Graduate Studies

Master of Total Quality Management and Excellence

Questionnaire no (1)

Risk Assessment of Exportation and Importation Animals and Animal product in Khartoum Airport

a. this Questionnaire Data used for research purposes only

b. Information mentioned in Questionnaire will be treated confidentially

c. Please answer all the questions listed below

Knowledge, attitude and practices of risks by workers whom direct contact with animals and animal product in airport:

1. Are you persistent of scientific knowledge in the field of research above?

Yes No

2. Updating of the knowledge? Yes No

3. Source of the knowledge? a).References b).Journals c).Internet d).Nothing

4. Freguency for updating of the knowledge? a)daily b)weekly c)monthly d)more than month

5. Availability of internet at work? Yes No

6. Time for last training?

7. Presence of regulation? Yes No

8. Knowledge about regulation?

9. Knew about signs and symptoms of infection disease?

10. Knowledge about risk?

11. Dealing with risk?

12. Consideration of transportation?

Attitudes of risks by workers whom direct contact with animals and animal product in airport:

1. Using gloves, lab coat (apron), mask, caps is reducing risk of contamination?

2. Worker who have abrasions or cut on hands should not touch animals or animal products without gloves?

3. Food hygiene training workers is an important issue in reducing risk of infection disease?

4. It is necessary to cheek the temperature of the refrigerator to reduce risk of contamination?

5. Health status of the workers should be evaluated before employment?

6. Zoonosis disease can have deleterious health and economic effects on the society?

7. Washing hands before and after work reducing the risk of contamination?

8. Proper cleaning and handling of instrument reduces the risk?

9. Eating and drinking in the work increases the risk?

10. Avoid any contact with animals and animal product reduce the risk?

Practices of risks by workers whom direct contact with animals and animal product in airport:

1. Do you wear apron during work?

2. Do you use gloves during work?

3. Do you use mask during work?

4. Do you wash your hands before using gloves?

5. Do you wash your hands after you touch animals or animal products?

6. Do you wash your hands after rest time when you come back to work?

7. Do you eat or drink in your work?

8. Do you smoke in your work?

9. Do you work in export and import animals and animal products in the same time?

10. Do you use shoos disinfection mat and related poster?

11. In the plane do you use any protocol to prevent the risk of introductions of disease transmitted by insects?

12. Do you have any training regarding to how to dealing with animals and animal products?