THE OPERATIONS OF QUARANTINE STATIONS AND THE IMPACT ON ANIMAL DISEASE PREVENTION AND CONTROL IN LAGOS STATE, SOUTH WEST, NIGERIA

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ABSTRACT

Nigeria is considered to have one of the highest burdens of endemic diseases globally and an annual incursion of highly contagious transboundary animal diseases in Africa. The entry points of diseases into the country includes: airports, seaports and land borders. The study was conducted in Lagos, southwest geopolitical zone to evaluate the operations of the quarantine stations, namely: Murtala Muhammed International Airport, Apapa Seaport and Tincan Island Seaport. The stations were evaluated based on procedures and licenses, check operations, reporting and documentation, animal traceability and facility. Validated questionnaires and score sheets prepared according to the OIE standard were used for data collection. The stations were identified as A, B and C, respectively, in order to conduct blinded data analysis. Overall, Station A had 41.9 % of the total marks obtainable by the station. Station B had 26.3 %, while Station C had 45.5 % standard compliance score. Overall, low proportions (10 %) of the respondents are veterinarians, with 67 and 23 % of these having Bachelor of Science Degree in agricultural and non-agricultural related qualification respectively. The study established that facilities and equipment available at each station was found to be below the international standard while none of the stations has an onsite diagnostic laboratory. Inadequate man power, facilities, vet professionals, and equipment are observed to be the reasons for inefficiency. Government, organizations and administrative officers involved in animal quarantine need to improve on the procedures, operations and facilities at these stations to prevent animal disease incursion.

Keywords: Quarantine stations, Operations, Animals, Diseases

INTRODUCTION

Animal health has significant effect on public health, animal production and the economy of a country at large. Animal health directly impacts public health, because some animal diseases are transmissible to humans, and because of food safety issues (European Court of Auditors, 2016). The health of a country can be graded based on the number of healthy animals in the country or the absence or reduced incidence of animal diseases in the country (Perry and Grace, 2009). The livestock industry is the principal source of animal proteins (meat, milk and eggs) which are vital for human growth and maintenance (Fadiga *et al.,* 2013). According to the Food and Agriculture Organization of the United Nations (FAO), 35 g of animal protein per person per day is considered a basic requirement which can only be sourced from livestock (FAO, 2017). Optimal animal health is essential for optimal growth and physiological

functions of cells, tissues, organs and systems in the animal. Optimal physiological functions lead to maximal production of meat, milk, wool, hide, skin and other animal by-products. It also leads to enhanced reproductive performance of animals.

Diseases of animals cause a disruption or breach in these physiological functions leading to a reduction in growth, animal productions and its associated returns and ultimately leading to reduced GDP for a country culminating in a bad economy. Disease may be defined as an alteration of the state of the entire body or of some of its organs, which interrupts or disturbs the proper performance of body functions (Herholz *et al.,* 2006). Therefore, animal disease is an alteration of the state of the entire body of an animal or of some of its organs, which interrupts or disturbs the proper performance of body functions of the animal. Animal diseases cause a deviation from the normal physiological functions of the body of an animal. A host of these diseases exist with some having direct effects on humans, such diseases are referred to as zoonotic diseases or zoonoses.

Quarantine is an active measure in the control of animal disease. Quarantine refers to the placing of restraints on the movements of exposed or infected animals, animal products, vectors and formites, to prevent any direct or indirect contact with indigenous animal population for a specified period of time (Ogundipe, 2000). Quarantine is also defined as the totality of measures taken to prevent the entry of foreign exotic pests, pathogens, and diseases of plants, animal and aquatic resources through international boundaries/travelers and at the same time prevent the dissemination across international boundaries of these organisms through export trade (Areola, 2010). In Nigeria, quarantine measures and control programs fall under the jurisdiction of the Nigeria Agricultural Quarantine Services (NAQS). NAQS is a regulatory agency under the Federal Ministry of Agriculture and Rural Development, created for the harmonization of plants, veterinary and aquatic resources (fisheries) quarantine in Nigeria, and to promote and regulate sanitary (animal and fisheries health) and phytosanitary (plant health) measures in connection with the import and export of agricultural products with a view to minimizing the risk to agricultural economy, food safety and the environment (NAQS, 2014). In the past few years, the high incidence of emerging and re-emerging diseases in the country, with a high number of these diseases having zoonotic tendencies and been transboundary has led to the need to evaluate the nation's borders and preventive and control measures.

Nigeria is considered to have one of the highest burdens of endemic diseases globally and one of the four countries that contributes 44 % of the world's poorest livestock keepers. Diseases like anthrax, zoonotic tuberculosis and rabies are widespread among livestock keepers, but their neglected nature provides a false perception of low public health importance. Besides the burden of endemic diseases, the country has also experienced the incursion of highly contagious diseases like Ebola Virus Disease, Avian Influenza and Lassa fever (Olumade *et al.,* 2020). These transboundary animal diseases are the major concern to the government, veterinarians, farmers and the population at large.

Disease prevention and control measures in the country have evolved and improved over the years but the continued incidence of disease calls for a need to evaluate the programs, policies and control measures enacted for animal disease control in the country. For this evaluation to be effective it is important to trace the disease dissemination pathway from the entry point into the country and contacts of diseased animals with other animals. The entry points of diseases into the country includes: airports, seaports and Nigeria borderlines with neighboring countries. Quarantine stations are found at airports and seaports whereas international control post are found in border areas.

There are 10 quarantine stations and 34 international control post in the country (FMGN, 1988). This research work focuses on quarantine stations, their operations and their compliance with the OIE-World Organization for Animal Health standards and animal disease control act guidelines for quarantine services (WOAH, 2004), and the level of compliance of

importers with the rules and procedure for importation so as to establish disease entry routes, and problems associated with disease entry into Lagos State, South West, Nigeria.

MATERIALS AND METHODS

Study Area: The study area was Lagos State, located in the Southwest Geopolitical Zone of Nigeria. There are three quarantine stations located in Lagos State. The quarantine stations are located at the Murtala Muhammed International Airport (MMIA), Apapa Seaport and Tincan Island Seaport (Figure 1).

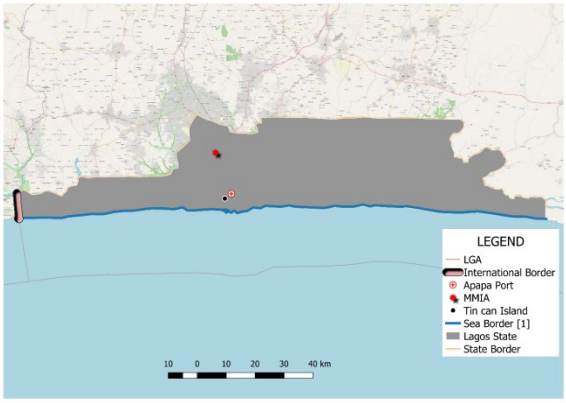

Figure 1: Map of Lagos State, Southwest, Nigeria showing the three quarantine stations where the study was conducted

Other quarantine facilities in the southwest geopolitical zone not considered in this study are the international control posts located in Idiroko, Ogun State and Seme Border, Lagos State.

Study Design and Population: A cross sectional survey was conducted using questionnaires administered to staff of the quarantine stations that work in the animal department.

Interview Questionnaire and Score-Sheet: A combination of an open and closed ended questionnaire was used for this study. After the design, an initial face-validation, followed by a content validation and reliability check were performed as described by Bolarinwa (2015). A six-man panel of experts was set up to review the questionnaire for relevance and clarity. Cronbach alpha value of 7.5 and a scale-cumulative validity index(s-CVI) of 8.0 were obtained for the reliability check and pre-test, respectively. The questionnaire was composed of the following: (i) Personal data such as questions to determine age, sex, educational level, field of study and profession and advancement of training. (ii) Office data such as questions to determine department, duration of employment and work experience of staff in the department and station. (iii) Assessment of staff's knowledge on the organizations involved in animal disease control such as questions on the duties and guidelines of the World Animal Health Organization (OIE) and the guidelines stated in the Animal Disease Control Act of Nigeria. (iv) Operational risk assessment of staff such as questions on hazards posed by working in the department, operations and measures put in place to protect workers and the upgrading and refurbishing of equipment.

The score sheet was designed using OIE standard and composed of the following: (i) Assessment of procedures and licenses such as questions on the certificates, licenses and permits issued in the stations and the processes involved in approval of these documents. (ii) Assessment of documentation and reporting of activities in the stations and operations carried on arrival of animals and consignments passing through the station. (iii) Facility and equipment assessment such as questions on availability and working conditions of equipment and facility.

Sampling Technique: A finite population was sampled and a purposive method of sampling was used and an informed consent was taken. The questionnaires and score sheets were administered to respondents. A total of 30 questionnaires were used. The study lasted for a period of eight months (October 2020 to May 2021).

Data Analysis: The stations were deidentified as A, B, and C in order to conduct blinded data analysis. The data obtained were entered into Microsoft Excel sheet version 15.0 and exported to SPSS version 21.0 for analysis. Frequencies and percentages of all variables were calculated. Non parametric tests were used to assess for

the presence of any significant difference among the staff response from the three stations. Chi-square test was used to compare the parameters as appropriate and statistical significance was set at $p<0.05$. The results of this study were presented in descriptive and inferential statistical format.

RESULTS

A total of 70 questionnaires and score-sheets were distributed and 55 were recovered with 50 being analyzable. Thirty questionnaires were analysed with an overall response rate of 50% recorded at station A, B and C having response rates of 100, 80 and 30 % respectively (Table 1).

Table 1: Response rate of staff of the three quarantine stations in Lagos State, Southwest, Nigeria

Quarantine stations	Number of staff at the station	Response rate	
		Number	Percentage (%)
A	10	10	100
B	10	8	80
C	40	12	30
All	60	30	50

A total of 20 score sheets were analysed, an overall response rate of 33 % was recorded with stations A, B and C having 70, 50 and 30 % response rates respectively (Table 2).

Table 2: Percentage scores of staff of the three quarantine stations in Lagos State, Southwest, Nigeria

Quarantine stations	Number of staff at the station	Response rate	
		Number	Percentage (%)
A	10	7	70
B	10	5	50
C	40	8	20
All	60	20	33

Analysis showed that all respondents had some level of education (Table 3), with all the stations having more male than female employees (Table 4). 80 % of the staff fell within the age bracket of 31 – 50 years. Station A had more staff within the bracket of 31 – 40 years of age, while station B had the highest percentage of staff between the age bracket of 31 – 50 years and station C had more staff older than 50 years (Table 5).

Table 3: Educational qualification of staff of the three quarantine stations in Lagos State, Southwest, Nigeria

Stations	SSCE (%)	OND (%)	HND (%)	BSC (%)	Others (%)
A	0	0	62.5	0	37.5
B	16.67	0	41.67	33.3	8.33
C	0	0	40	50	10

Table 4: Sex distribution of staff of the three quarantine stations in Lagos State, Southwest, Nigeria

Stations	Male (%)	Female (%)
A	87.5	12.5
B	66.67	33.33
C	70	30

Table 5: Percentage response of workers per age group for the three quarantine stations in Lagos State, Southwest, Nigeria

Location	Percentage (%) response of workers per age group				
	Less than 20 years	21 – 30 years	31 – 40 years	41 – 50 years	50 years and above
A	0	12.5	12.5	37.5	37.5
B	12.5	0	16.67	33.33	50
C	0	0	40	50	10

Respondents' relevance of qualification indicated that a low proportion (10 %) of the respondents were veterinarians, with 67 and 23 % of these having Bachelor of Science Degree in agricultural and non-agricultural related qualification respectively (Table 6). None of the veterinarians indicated having a private practice. Regarding the duration of employment, majority (75 %) of the staff in the stations have worked in their respective stations for over 5 years. Analysis showed that the stations are close to urban areas (77 %) and have a staff population range of between <20(47 %) and 21 – 50(40 %).

The knowledge assessment of the staff indicated that a small population (23 %) of the staff knew about the OIE Terrestrial Animal Health Code, while 57 % of the total respondents agreed that the operations of the stations were in accordance with the dictates of the OIE Terrestrial Animal Health Code (Table 7).

Table 6: Relevance of qualification and eligibility assessment of staff of the three quarantine stations in Lagos State, Southwest, Nigeria

Relevance of Qualification	Percentage % response of workers per station who ticked (✓) Yes			
	All (n=30)	A (n=10)	B (n=8)	C (n=12)
Are you a veterinarian/ non veterinarian	10	10^b	13^b	8^a
Field of study				
Veterinary medicine	10	13^b	8^a	10^b
Agriculture	67	75^b	75^b	50^a
Non Agriculture	23	12^b	17^b	40
If a veterinarian, do you have a private practice	0	0	0	0
Duration of Employment				
Less than I year	2	10^b	0^a	0^a
2 – 3 years	4	0^a	0^a	8^b
3 – 4 years	20	20^a	75^b	17^a
More than 4 years	75	70^b	25^a	75^b
Proximity to urban area				
Near	77	80^a	100^b	75^a
Far	23	20^b	0^a	25^b
How many staffs are in the station?				
Less than 20	47	30^a	75^b	42^a
21 – 50	40	50^b	25^a	42^a
51 – 80	10	20^b	0^a	8^a
More than 80	30	0^a	0^a	8^b
Is the station a separate facility?	27	40^b	25^a	17^a

a,b = percentages with different letter superscript on the same row are significantly different (p<0.05)

Table 7: Staffs' knowledge assessment in the three quarantine stations in Lagos State, Southwest, Nigeria

Staff Knowledge Assessment	Percentage % response of workers per station who ticked (✓) Yes			
	All (n=30)	A (n=10)	B (n=8)	C (n=12)
Do you know what the OIE Terrestrial Animal Health Code is?	23	20^a	13^a	33^b
Are the operations of the station in accordance with the "code"	20	23^b	19^a	18^a
Do you know what the animal disease control act is?	50	45	48	51
Are the operations of the station in accordance with the "act"	40	45^b	37^a	35^a
Have you heard of the term "risk analysis" before	40	38^a	43^b	39^a
Do you understand and know the processes involved in risk analysis	35	35^a	30^a	40^b
Have you gone on study tours to learn from experiences related to your job	10	10^b	13^b	8^a

a,b = percentages with different letter superscript on the same row are significantly different (p<0.05)

On the other hand, majority of the staff (73 %) knew about the Animal Disease Control Act of Nigeria and 77 % of the total respondents agreed that the operations were in accordance with the dictates of the Animal Disease Control Act of Nigeria. Regarding risk analysis 77 % of the staff had heard of the term, while 53 % understand and knew the processes involved. Very little proportion of the staff (10 %) had gone on study tours related to their job (Table 8). The stations were evaluated based on procedures and licenses, check operations, reporting and documentation, animal traceability, facility and equipment. The result summarized in Table 9 had the total marks obtainable for each section. Station A had a total of 315 points representing 47 % of the total marks obtainable by the station.

Table 8: Operational risk, state of facility and staff training evaluation in the three quarantine stations in Lagos State, Southwest, Nigeria

Operational Risk, Facility and Staff Training Evaluation	Percentage % response of workers per station who ticked (✓) Yes			
	All (n=30)	A (n=10)	B (n=8)	C (n=12)
Do you think working in the station exposes you to occupational hazard	80	90[b]	75[a]	92[b]
Is the hazard animal related	5	90[b]	25[a]	42[a]
Is the hazard procedure or operations related	63	60	63	67
Is the hazard equipment and facility related	5	40[a]	37[a]	75[b]
Are there measures put in place to protect workers in the course of discharge of their duties	50	60[b]	40[a]	58[b]
Are facilities and equipment in your department constantly upgraded to meet up with technological advancement	27	30[b]	25[a]	25[a]
What is your opinion on the infrastructure and general outlook of the station				
Excellent	10	10	12	8
Good	37	30[a]	63[b]	25[a]
Fair	43	50[b]	25[a]	50[b]
Poor	10	10[b]	0[a]	17[b]
Are seminars and workshops organized for staff of the station	77	90[b]	63[a]	75[a]
What is your opinion on the record keeping method of the station				
Excellent	7	10[b]	12[b]	0[a]
Good	40	40[b]	63[b]	25[a]
Fair	5	50[b]	13[a]	75[b]
Poor	3	0[a]	12[b]	0[a]

a,b = percentages with different letter superscript on the same row are significantly different (p<0.05)

Table 9: Compliance to standard procedures in the three quarantine stations in Lagos State, Southwest, Nigeria

Standard procedures	Total Obtainable	A	B	C
Procedures and licenses	30	17.1[a]	9.2[b]	14.4[a]
Check operations	13	4.2[b]	3.7[b]	6.2[a]
Reporting and documentation	10	5.5[a]	2.8[b]	5.0[a]
Animal traceability	17	5.0[a]	4.1[b]	5.7[a]
Facility and equipment	30	10.1[a]	6.5[b]	14.2[a]
Percentage (%)	100	41.9[a]	26.3[b]	45.5[a]

a,b = percentages with different letter superscript on the same row are significantly different (p<0.05)

Station B had a total of 185 points representing 37 % of the total marks obtainable by the station. Station C had a total of 320 points representing 40 % of the total marks obtainable by the station.

DISCUSSION

In Nigeria, importation of animals (pets) is done through airports, while importation of animal products, by-products and biologics are via seaports. The result of this study showed that the operations of the quarantine stations at the airport and the seaport in Lagos State for the prevention and controlled of animal diseases were grossly inefficient. This has a serious implication considering the fact that these stations are the main entry points of animals, animal products and biologics because they serve as gateway into Lagos State (particularly the seaports) which borders the Atlantic Ocean.

The inadequacy in the staff qualification indicated that the number of veterinarians at each station was low compared to other qualifications which are against article 3.2.5 of OIE Terrestrial Animal Health Code which states that "there should not be an over-reliance on

veterinary paraprofessionals but experienced field veterinarians should be employed" (OIE, 2019a). The Animal Department at each station was under staffed and thus should be looked into by the Federal Government. The facilities and equipment available at each station were far below the international standard, while none of the stations had an onsite diagnostic laboratory. This was also reported by Ogundipe (2002) who observed that inadequate veterinary manpower and clinical/diagnostic facilities have seriously limited the ability of Nigerian quarantine services to serve as an efficient disease monitoring mechanism. This inadequacy was further buttressed by the score sheet evaluation of procedures, operations and facilities of the stations which showed below average performance. This finding was in agreement with a previous finding by Areola (2010) who observed that functional, up-to-date, state-of-the-art quarantine facilities and well-equipped laboratories were yet to be introduced and put to use in Nigeria for effective quarantine service delivery.

All imports/exports of animals, animal products can only be done under a permit issued by the Quarantine Service which will state in which form these animals and their products can be exported or imported into Nigeria but certificate issuance is not always in compliance with the national legislation and regulations, or international standards. It was also observed that laboratory investigation was not usually carried as a condition for certificate issuance, even when such was very necessary. There was no national laboratory designated for veterinary public health analysis and certification of products. International veterinary certificate means a certificate, issued in conformity with the provisions of Chapter 1.2.2 of the OIE Terrestrial Animal Health Code (OIE, 2019a) describing the animal health and/or public health requirements which are fulfilled by the exported commodities is a vital document in granting imports or export permits is needed in Nigeria but is not issued by the quarantine service which may be attributed to the lack of diagnostic centers in the stations to access the health status of the animals or status of animal products, biologics or by-products.

The awareness of staff on the organizations involved in animal disease control showed that most staff knew about the Animal Disease Control Act of Nigeria but not about the OIE Terrestrial Animal Health Code, hence the need to train or re-train staff on quarantine facilities, procedures and surveillance strategies that conforms to international standard. Animal traceability and identification which are defined by OIE as the ability to follow an animal or group of animals during all stages of its life, and the combination of the identification and registration of an animal individually, with a unique identifier, or collectively by its epidemiological unit or group, with a unique group identifier (WOAH, 2004). Animal identification system means the inclusion and linking of components such as identification of establishments/owners, the person(s) responsible for the animal(s), movements and other records with animal identification (OIE, 2019b) was not achievable in the country due to the poor record keeping system of the stations as reflected in the scores from the stations, and lack of an identification system for the animals. This position has been reinforced by OIE with an emphasis on the need for accurate identification and traceability of animals, animal products and biologics.

Conclusion: The findings of this study showed that there are lapses in the animal quarantine services at the stations surveyed. These lapses are seen as: Inadequate man power and vet professionals, inadequate facilities and equipment, and laxity of quarantine procedure and operations. These lapses leave the country porous and exposes the country to disease outbreak especially transboundary animal diseases which may be zoonotic thus endangering public health, causing a reduction in farmers income and ultimately the GDP of the country. It is recommended that the government, organizations and administrative officers involved in animal quarantine should make provisions for the following: (i) Existing facilities and equipment should be upgraded to international standards. (ii) Onsite diagnostic laboratories and animal holding facilities should be constructed in each of the quarantine stations. (iii) Improve the welfare of staff. (iv)

Organize trainings and seminars for staff on the standard operations and procedures for animal quarantine. (v) Facilitate cooperation and relationship between others agencies within the ports and quarantine departments and officers.

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